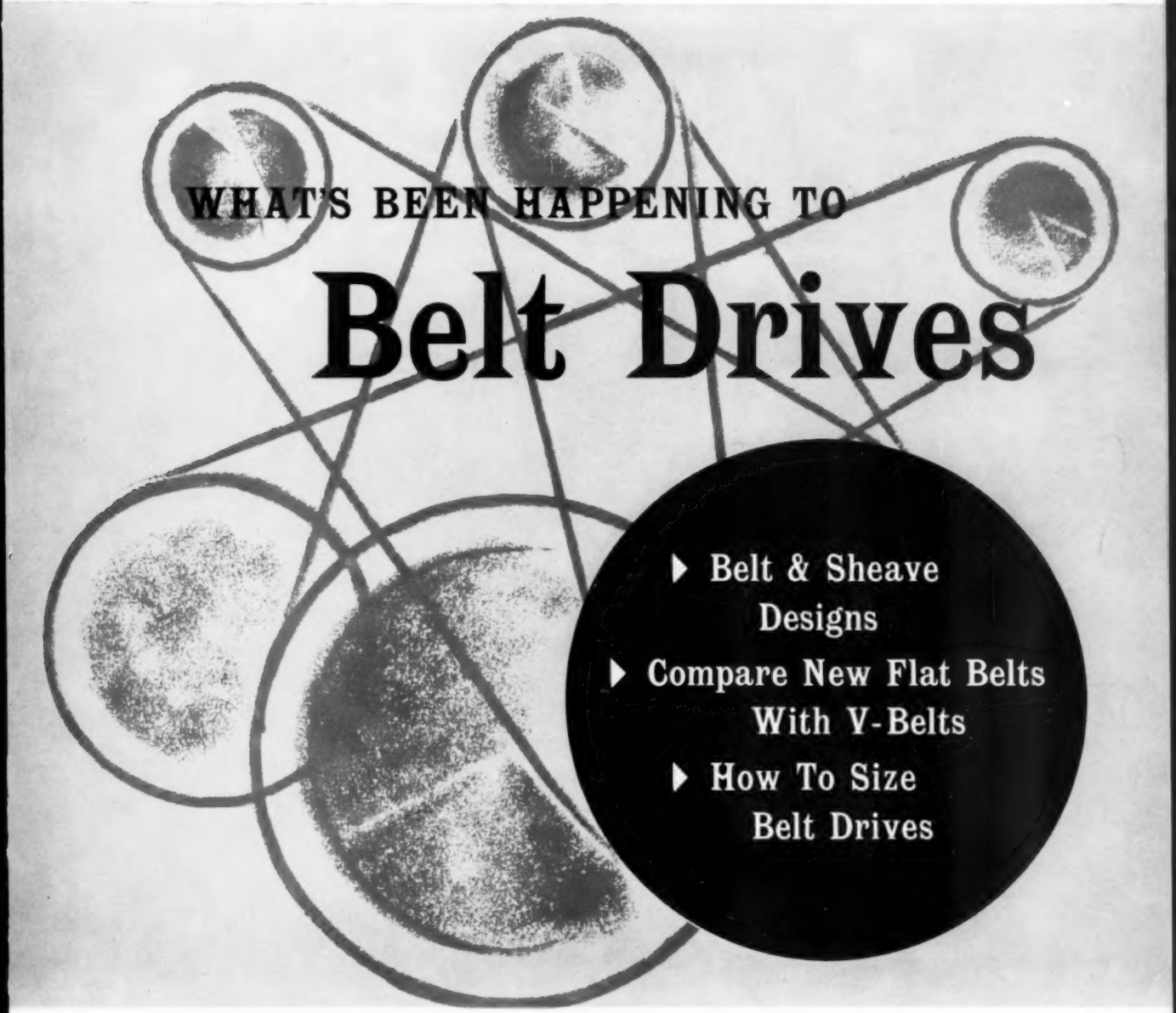
AUGUST 1961

POWER TRANSMISSION DESIGN

INCLUDING BEARINGS DESIGN/APPLICATION



WHAT'S BEEN HAPPENING TO

Belt Drives

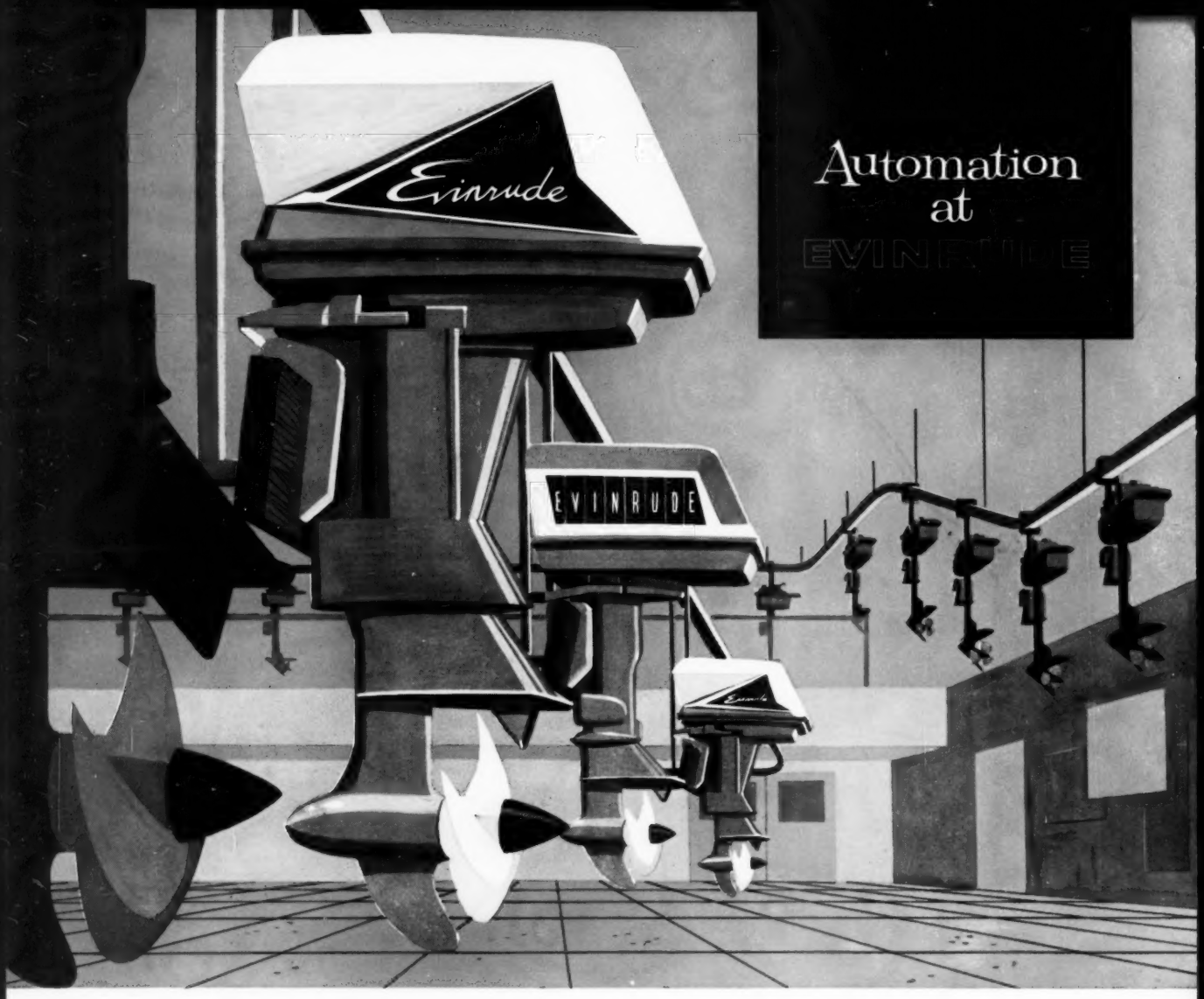
- Belt & Sheave Designs
- Compare New Flat Belts With V-Belts
- How To Size Belt Drives

ALSO IN THIS ISSUE:

Diesel hydraulics can push diesel electrics off the tracks

Transmission combines torque converter with power shift

User's guide to bearing mounted units



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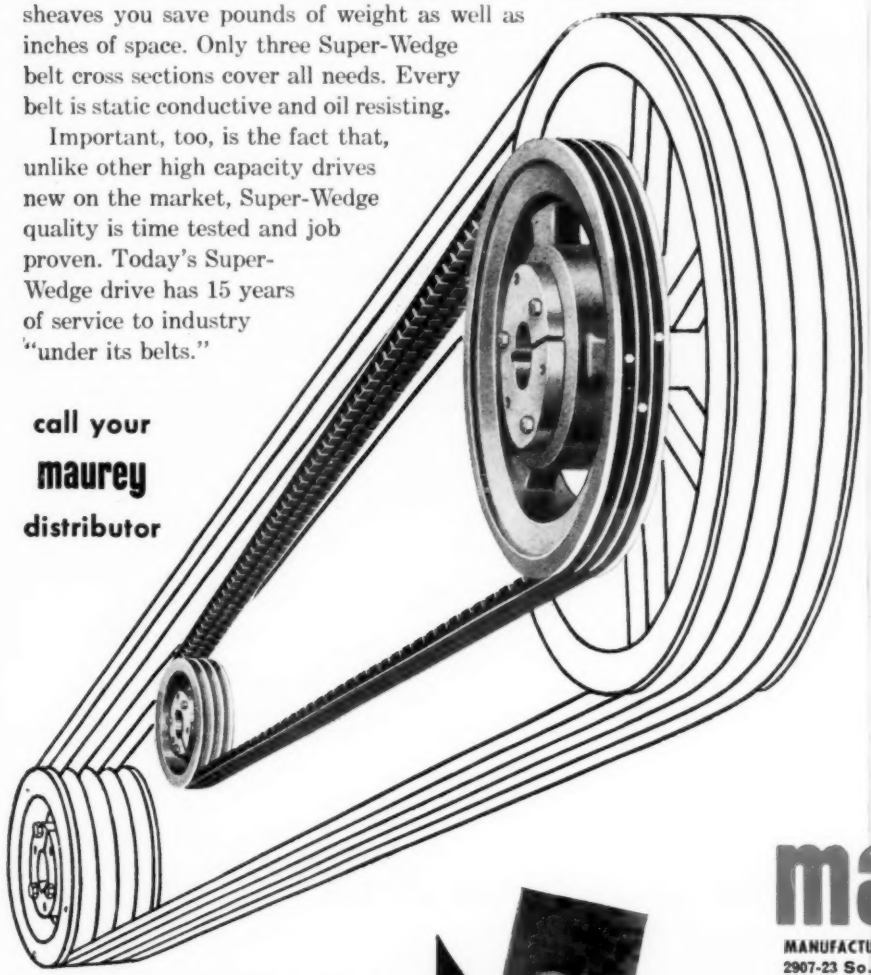

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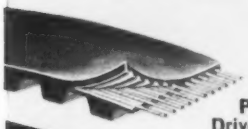
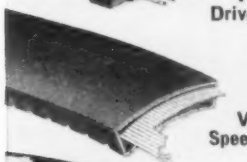
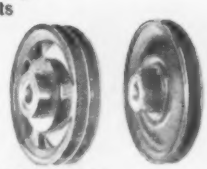


Positive Drive Belts

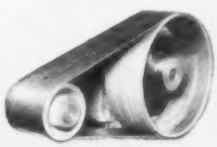


Variable Speed Belts

Mor-Grip V-Belts



Hi-Q FHP V-Pulleys



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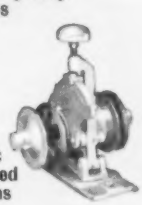

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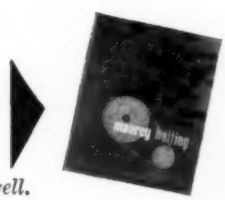

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TB 103

Wherever the design and production of power equipment is involved, you'll find US Industrial Rubber Products...helping to simplify the design, improving the efficiency and reliability of equipment both new and old, adding to the profit of manufacturer and operator alike.

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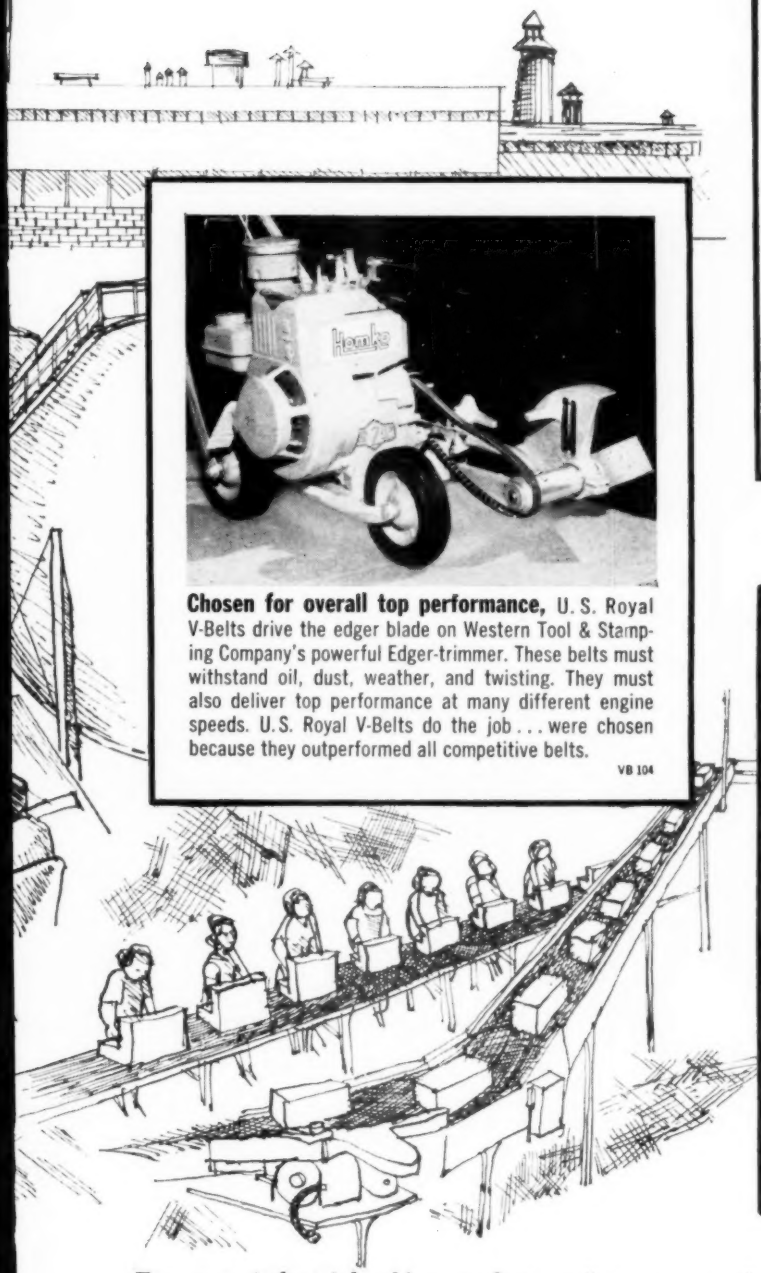

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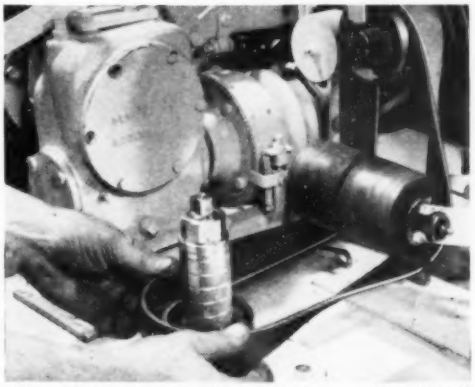

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POWER TRANSMISSION DESIGN

THE MAGAZINE OF MACHINE DRIVES

AUGUST 1961

volume 3 number 8

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Bearing analyzer electronically eliminates torque produced by test equipment.

FACTS AT YOUR FINGERTIPS:

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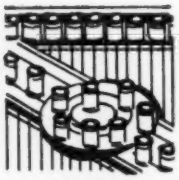
you save it from RUIN
every time this clutch cycles . . .



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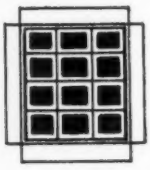

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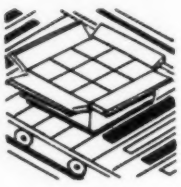

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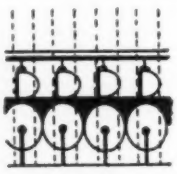

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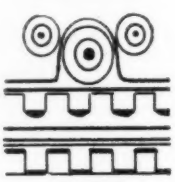

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POWER TRANSMISSION EQUIPMENT

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LETTERS

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Power Transmission Design
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Must belt idlers be belt breakers?

Referring to your June article, "Flat pulley is V-belt speed control," p26, I know that it is often said the belt idlers are belt breakers. This, I think, is the reason you say designers frown on this design.

In many other cases, having high ratio reductions, or close pulley centers, idlers have definite advantages. In fact, they are sometimes the only way to adapt a low-cost V-belt drive to a particular application.

So why don't designers roll up their sleeves, and build a V-belt that likes idlers, and can be moderately bent in two directions? I don't believe that it cannot be done.

Incidentally, it has been my experience that idlers can be used, but that the largest possible idler does the least damage due to flexing. I had to find this out the hard way—two V-belts too late.

H. LANDAUER
Port Machine Shop,
Tampa, Fla.

May we refer you to our feature article, on Belt Drives, p 22. You will find there a hexagonal (or double-V) belt designed specifically for reverse flexing. Probably the manufacturer in our June article was using a large enough pulley to prevent flexural failure. In any event, he could have used a double-V belt, together with a V tensioning pulley. This would have been more expensive.

Again, that flat pulley speed control . . .

We are interested in obtaining more information about the end rolling machine covered in your June article, Flat Pulley is Speed Control.

JAMES TOENSING,
Chief Engineer
Remmele Engineering Inc.
St. Paul, Minn.

Requests for information, and further comments should be addressed directly to:
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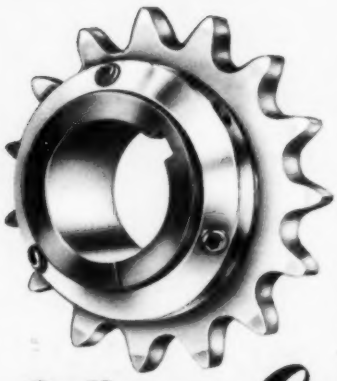

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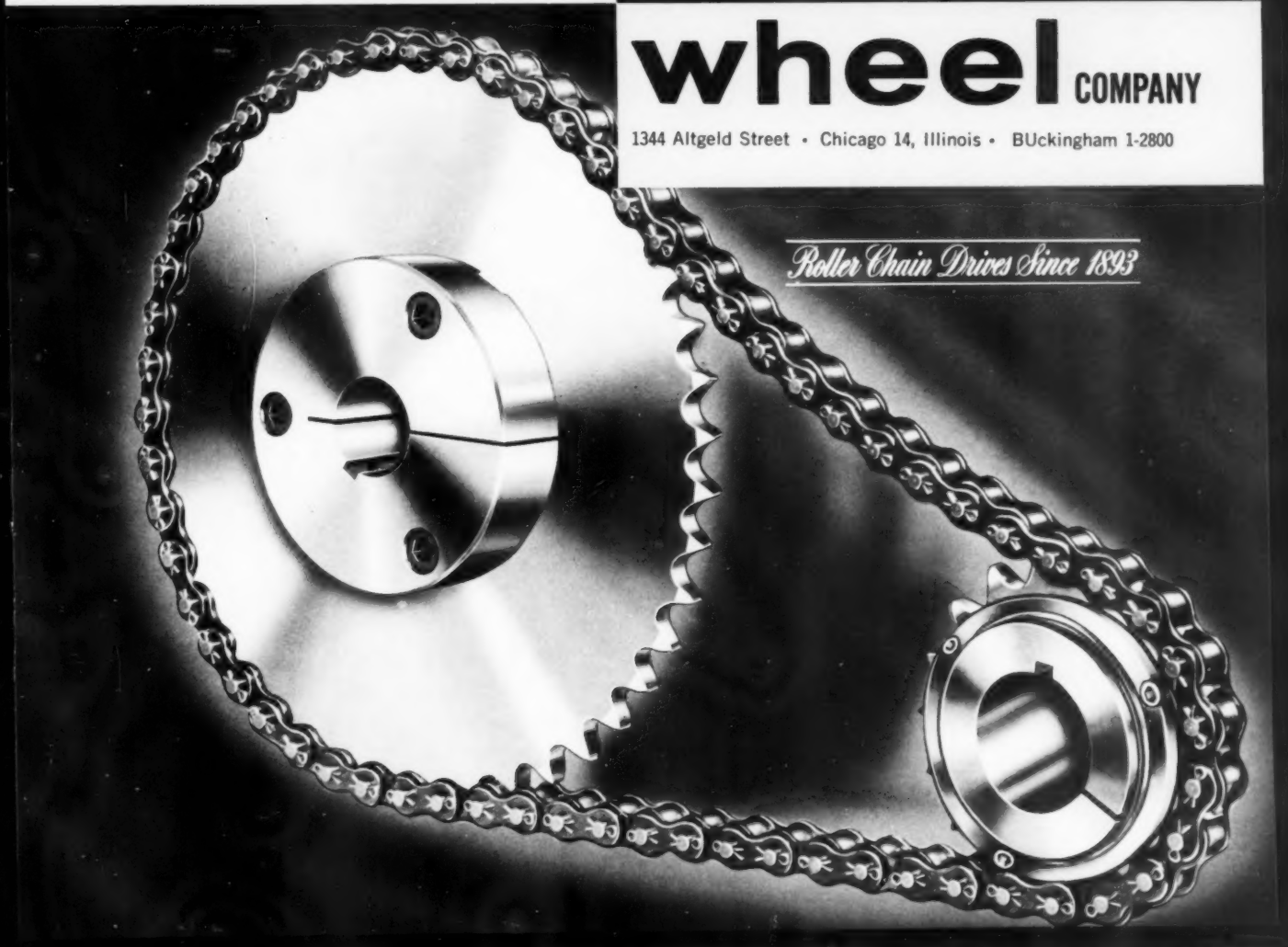

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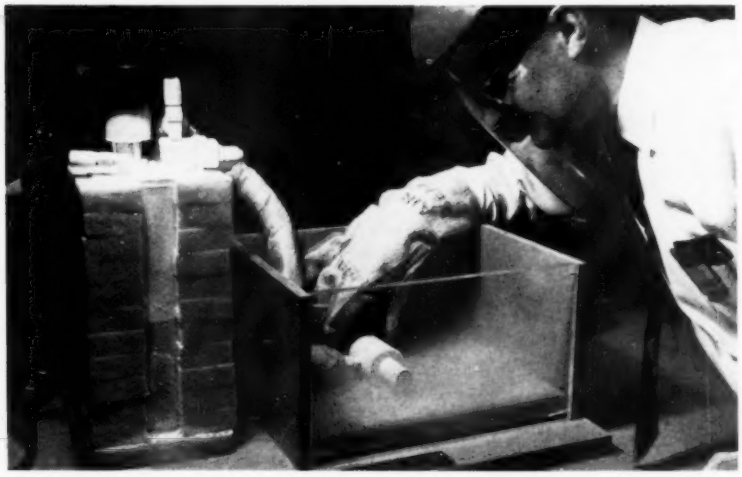
NEWS

from the power transmission field

Simple air bearing spins at 100,000 rpm



The load-carrying shaft of an externally pressurized step bearing spins freely on a cushion of air. This new design is simpler than conventional externally pressurized bearings.

In the conventional bearing, compressed air flows through tiny orifices in the shaft housing. This forms a low-friction cushion for the shaft to ride on.

The new design employs only one easily-drilled opening. Pressurized air enters the shaft housing through this opening. Then, a shallow recess machined into the shaft traps the incoming air. This trapped air lifts the shaft and lubricates the bearing.

The recess traps only enough air to meet load requirements. The new design throttles air flow as it escapes from the recess rather than at the inlet, as with the conventional bearing. Step bearings are less expensive to produce and use simpler air-regulating equipment. Also, they are less prone to damage.

Boeing Co., Seattle, maker of the new bearings, has operated step bearings with shafts ranging from ½ to 5 in. in diameter at speeds up to 100,000 rpm. Ambient operating temperatures have ranged from −330 to +600F. Applications include machine tools, high-speed turbines, nuclear equipment.

Fuel cells—Studebaker-Packard research

Development of a practical fuel cell is the main object in the research program at the new technical center of Studebaker-Packard Corp's Onan division at Minneapolis. C. W. Onan, division president, says operating efficiencies up to 80% are possible through continuous conversion of chemical to electrical energy in a cell.

Survey shows new high for lubricant production

The fourth annual production survey of the National Lubricating Grease Institute shows that over one billion pounds of lubricants were produced in the U. S. during 1960, and over 76 million in Canada. This is an increase over 1959 figures and represents the highest production in the four years the survey has been taken.

The survey showed trends in the use of various soaps in greases and a sharp fall off in the use of lubricating grease for heavy industrial purposes, such as steel mills.

Non-member firms may purchase copies of the survey from: NLGI, 4638 J. C. Nichols Parkway, Kansas City, Mo.

Revised ball and roller standards

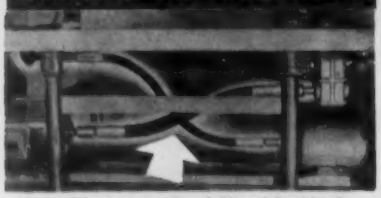
Further progress in the standardization program aimed at updating American standards for ball and roller bearings comes with approval by the American Standards Association of two revised standards.

The two standards—*American Standard Tolerances for Ball and Roller Bearings, B*3.5-1960, and *American Standard Specifications for Mounting Ball and Roller Bearings, B*3.8-1960, were developed by the 28-member B3 sectional committee sponsored by the Anti-Friction Bearing Manufacturers Association. Both are revisions of 1951 standards.

*American Standard B*3.5-1960 establishes grades of precision for bearings for proper application in all types of equipment. It provides tolerances for radial, airframe, magneto and thrust ball bearings: for cylindrical, spherical, needle, self-aligning, and tapered roller bearings; radial internal clearance for single row ball bearings: snap ring and groove dimensions, hardness tolerances for ball rings and rollers, dimensional and hardness tolerances for loose rollers and tolerances for side runout of lock-nuts.

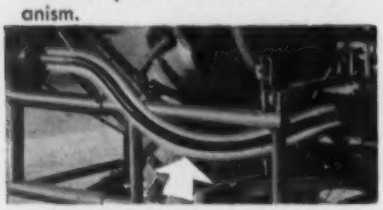
*American Standard B*3.8-1960 sets out the features of the hous-

Here's how Elliott
Flexible Shafts are Saving TIME and MONEY



Two Elliott Standard Flexible Shafts drive special processing machine and vibrator operating simultaneously. Flexible Shafts isolate vibration of table from motors.

Four ¾" Standard Flexible Shafts used in special production machinery in box manufacturing company eliminate parts and intricate mechanism.



Safety is enhanced, appearance improved by coupling bale loader to tractor's power take-off with a Standard Flexible Shaft. Separate gas engine for loader is eliminated.

One Elliott Flexible Shaft assembly can replace many parts, saving assembly time and labor. In one application, a Flexible Shaft for a textile machine replaced 50 parts, reduced cost of original mechanism by two-thirds.

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'FLEXIBLE SHAFT DATA FOR DESIGNERS'

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NEWS

ing and shaft that affect the proper fit of a bearing. It has 18 tables which covers the various specifications for mounting ball and roller bearings.

Organizations on the standards committee include AGMA, ASME, NEMA, U. S. Departments of the Army, Navy, Air Force, etc. Copies of the standards can be had from the American Standards Association, Dept P 243, 10 East 40th St., New York 16. *American Standard B*-3.5-1960 sells for $1.80, *B*-3.8-1960 for $2.30.

Frequency converter does without gears

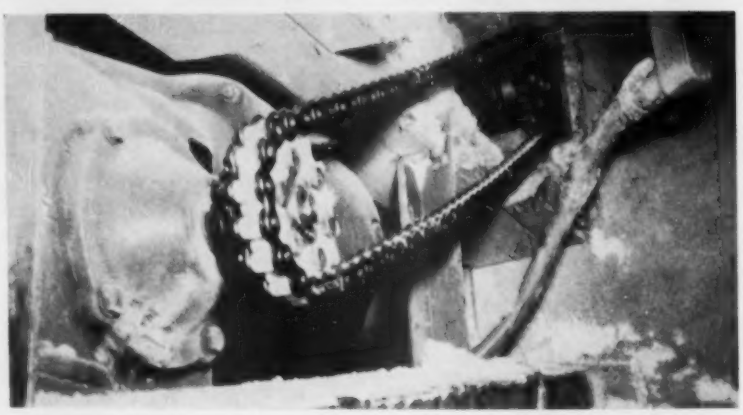
A device that changes conventional 60-cycle ac power to any lower frequency without the use of gears or other speed reducing equipment, is expected to greatly cut costs in steel mills and other heavy industrial plants.

The device, named the Speedmaster Frequency Converter, has been developed by Bogue Electric Mfg. Co. According to company president Edward P. Schinman, a special division has been formed to make and sell the converter and associated controls. Schinman estimates the annual sales potential of the new division at $10 million. Main application of the device will be to supply power for slow moving roller table and conveyors.

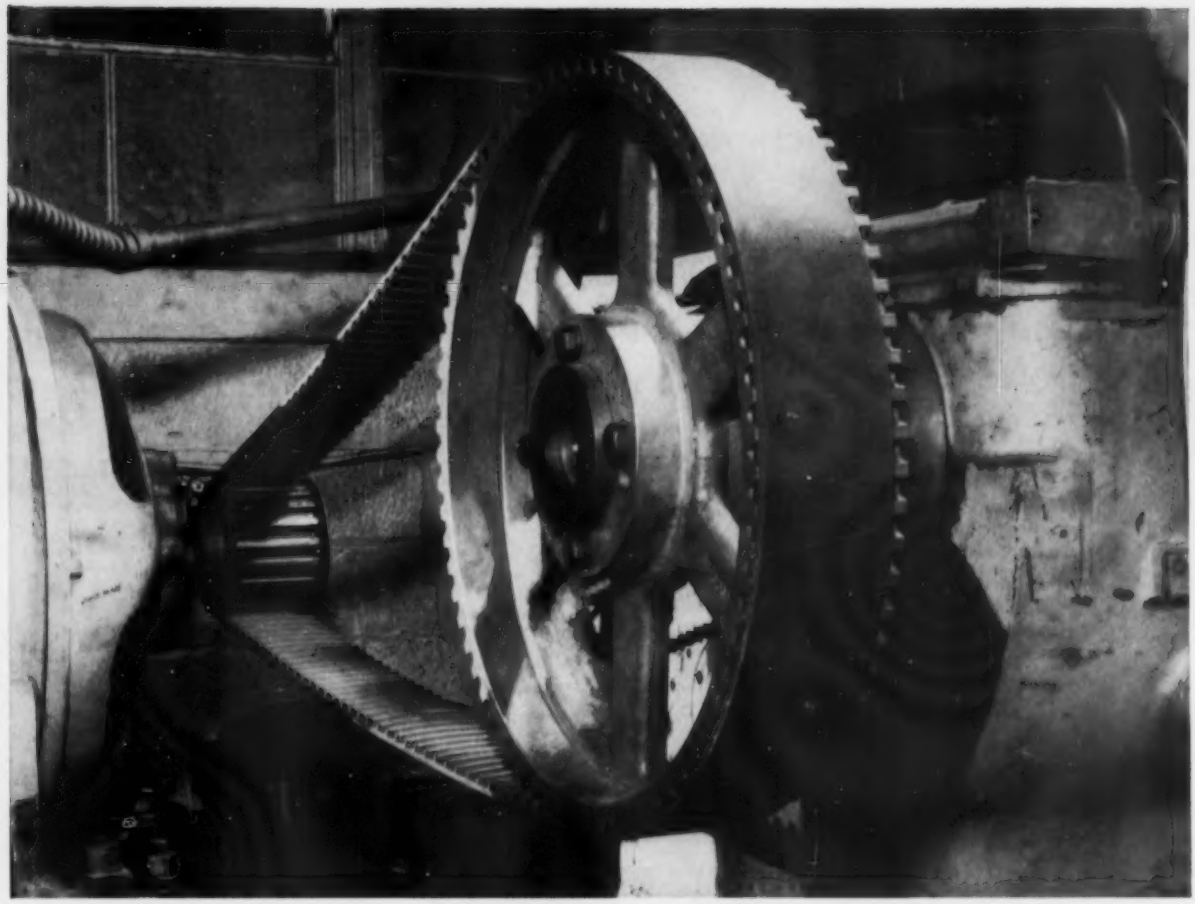
Seminar on hydrostatic transmissions

Hydrostatic transmissions, much in the news lately, will be the subject of a 1-day seminar to be held in the Allen-Bradley Hall of the Milwaukee School of Engineering on Sept. 27. The seminar will be divided into three sessions—a

Continued on page 14



FREEZING LUBRICANT causes the chain shown in the top photograph to kink and elongate. Use of a chain with a self-lubricating plastic stud bushing, shown in the bottom photo, keeps chain tight and sheds ice. The drive connects a motor reducer to a wire conveyor in the —30F freezing room of a meat packing plant. The bottom chain comes from Hewitt-Robins, has Delrin bushings.



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Wood's has the drive, the positive action Timing Belt Drive . . . PLUS THE EXPERIENCE it takes to give positive, workable solutions to your power transmission problems. Wood's Timing Belt Drives provide instantaneous, slip-free response . . . *full* power transmission. They require no lubrication, no motor bases, no tensioning devices. Belt matching is eliminated. And, their speed range is exceptional . . . from 0 to 16,000 fpm. Load capacities range up to 600 hp and above. Belts are unusually strong, but they are thin and flex readily, eliminating heat build-up, maintaining high operating efficiency. When you want positive action, investigate Wood's Timing Belt Drives. You'll find outstanding solutions to a wide variety of drive problems.

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general introduction to hydrostatic transmissions, design analysis, and practical applications. A panel discussion will close the day.

Following the seminar, the Milwaukee Chapter of the Fluid Power Society plans to hold a dinner meeting at which Frank Flick will speak on "Cylinder Design and Application Concepts."

Registration fee for the seminar is $20 per person for advanced registration, $25 at the door. For the Fluid Power Society meeting, the only charge is the price of the dinner.

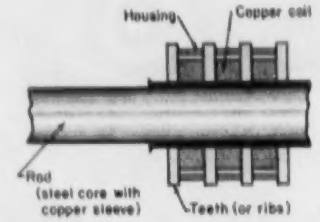
Induction-Type Linear Actuator Delivers Constant Output Force

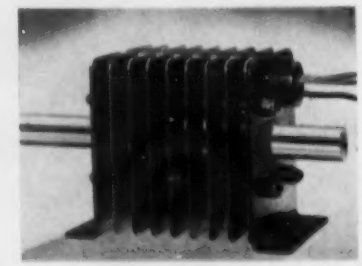
An unusual electromechanical linear actuator, or induction solenoid, has a single moving part, and exerts constant force throughout its stroke in either direction.

Called the Polynoid actuator by its manufacturer, Skinner Precision Industries, New Britain, Conn., the actuator consists of a copper-clad steel rod—the only moving part—mounted in a housing made up of a series of induction modules.

As ac electricity sweeps along the segments or modules, the magnetic field causes the rod to move, like the armature of an induction motor. Speed of cycling and length of stroke, as well as force output, are controlled by varying the electrical input. Any of these output characteristics can be changed while the actuator is operating. No return springs are necessary.

Presently available models provide a holding force up to 2 lb at continuous duty; holding force can go over 30 lb for intermittent duty. More-powerful units are in the works. Strokes are up to 6 in., but stroke length may be increased by adding induction modules and by providing external bearing support. Power requirement is from 63 to 91 watts for present units.





Skinner believes the Polynoid actuator can replace solenoids, pneumatics, hydraulics, and conversion-of-motion devices in many existing machines. Its constant force throughout the stroke length, and the proportionality between power input and force output make it suitable for holding, positioning, feeding, or in control devices, working against a bias.

TEST MODEL of a new type of rocket engine devised by himself is adjusted by Gary L. Cosens, graduate student in aeronautical engineering at The University of Michigan. The motor is called a "rotating detonation engine" because it uses a detonation wave which races round the circular slot to ignite the fuel mixture. Burning rate is about 100 times that of standard rocket engines, producing much more power. Theoretically after eliminating problems such as overheating, such an engine only six feet in diameter could produce a thrust of 1½ million pounds.

Business news in brief

. . . **Manheim Mfg. & Belting Co.** purchased the **Automatic Motor Base Co.**, Windsor, N. J. Automatic will operate as a division of Manheim, to be known as **Manheim Automatic Motor Base Co.**

. . . **Hupp Corp.** acquired the assets of **Hercules Motors Corp.** in an agreement in which 2½ shares of Hupp common stock were exchanged for each share of Hercules stock.

. . . **Dayco Corp** plans $1 million expansion of production, shipping and warehousing facilities in Springfield, Mo. and Waynesville, N. C.

. . . **Imperial Metallic Lubricants, Inc.**, Cleveland, has been acquired by Andrew Thompson, president of **A. T. Supply, Inc.**, and **Industrial Transmissions,**

Three great names in couplings

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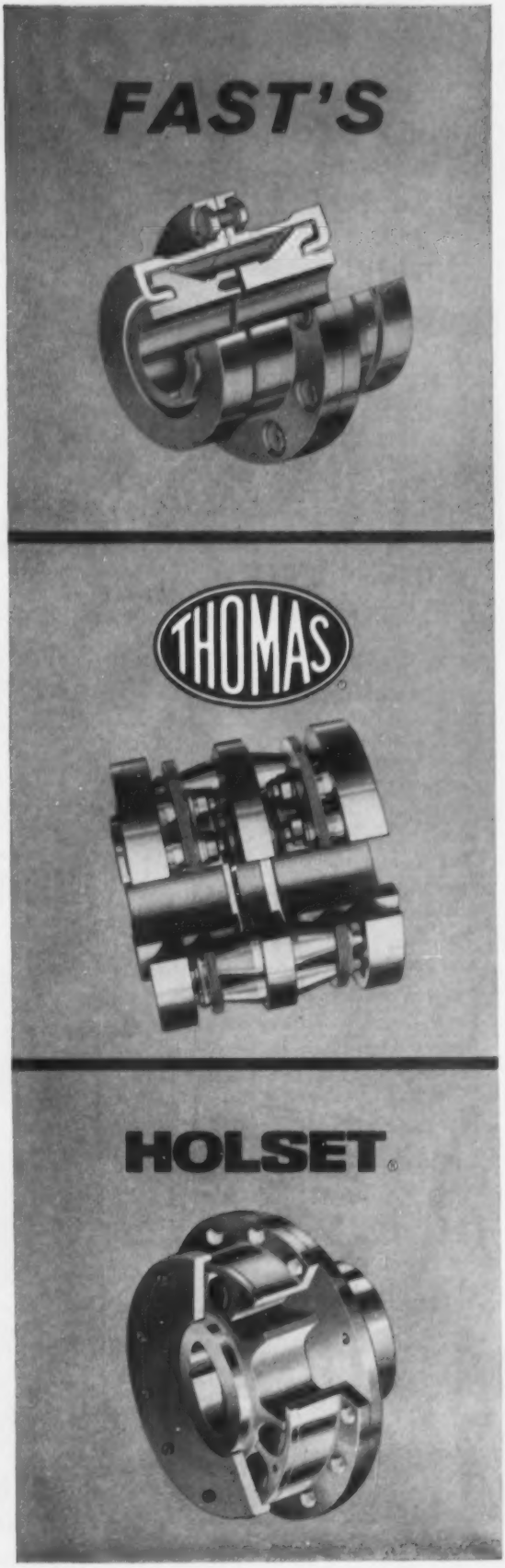
With the acquisition of the Thomas Flexible Disc Coupling line, Koppers now provides engineering solutions to a wide range of industrial coupling problems. Need a lubricated gear-type coupling for transmitting high loads? Koppers world-famous Fast's coupling line does the job on shafts up to 32 inches. Need a maintenance-free flexible-disc coupling with no backlash? The highly engineered Thomas line holds the answer—with miniature couplings as small as 1/12th of an ounce. Need a coupling to absorb impact or vibration? The Holset line of resilient, non-lubricated couplings protects equipment in most diesel, compressor and shock load applications.

Because each of these coupling lines has its particular application in industry . . . and because each is a recognized name in the power transmission field . . . you can continue to buy them by brand—just as you have in the past. Of considerable importance are the experienced, extensive engineering and manufacturing services of the entire Koppers organization that are available to help you with your power transmission problems . . . in any size, in any quantity, for any use.



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NEWS

Inc. Imperial will be exclusive stocking distributor of Molub-Alloy in Ohio.

. . . **Western Gear Corp.** appointed **C. H. Spenser & Co.** as sales representatives in the Utah area.

. . . **Formsprag Co.** recently completed a 2500 sq ft addition to its headquarters office in Warren, Mich.

. . . **Worthington Corp.** appointed two new distributors who will handle the full company line: **A. C. Supply Co., Inc.,** Philadelphia, Pa. and **Border Machinery Co.,** El Paso, Texas.

. . . **General Electric Co.** recently formed a Marine and Industrial Operation at its Flight Propulsion Division headquarters in Evendale Brooks F. Brickley was named manager.

. . . **Crescent Fastener Co.** recently bought the assets of the **Crescent Belt Fastener Co.,** now under new management.

MEETINGS

JULY 24-AUG. 10

International Trade Fair and Aviation Exhibition McCormick Place Exposition Center, Chicago, Ill.

14-17 **Society of Automotive Engineers, Inc.,** National West Coast Meeting, Sheraton-Portland Hotel, Portland, Oregon.

AUG. 28-SEP. 1

American Society of Mechanical Engineers, International Conference on heat transfer, Boulder, Colo.

11-15 **Society of Automotive Engineers,** National Farm, Construction and Industrial Machinery Meeting, Milwaukee Auditorium, Milwaukee.

14-16 **Packaging Machinery Mfrs. Institute,** 29th Annual Meeting, The Homestead, Hot Springs, Va.

18-22 **Instrument - Automation Conference and Exhibit,** New York.

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These **Over-Center Clutches** are General Purpose, heavy duty, friction clutches for machines requiring high quality dependable clutches with low power losses, low upkeep, and long life. Built in *Flex-Disc,* Solid Disc (two halves), and Gear Tooth types.

Five sets of over-center toggles provide two to three times greater bearing surface. Easily adjusted for wear by releasing latch and turning toggle assembly.

We offer a complete Clutch Engineering and Manufacturing Service — designing, producing, and applying clutches to meet any conditions arising in industry.

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Excessive heat build-up caused by constant flexing — even in environmental temperatures — is the major cause of V-belt deterioration. BOSTRON with Neoprene remedies this problem.

Neoprene withstands heat up to 165°F. (ordinary belts deteriorate at as low as 115°F.), and gives greater resistance to oils, ozone, chemicals, abrasion. This means a high safety margin, long life.

Neoprene with Fiber-Dispersed Stock in BOSTRON'S compression member provides: (1) high cross-wise rigidity, (2) exceptional length-wise flexibility, and (3) extra tensile member support. Fibers are closely packed, in straight lines, and virtually frictionless.

BOSTRON'S Tensile Member, by actual test, gives greater stability, 40% more strength, and is inherently stretch resistant. Moisture gain is only 1/20th that of conventional reinforcing fiber. A special heat and tensioning process for the cords further minimizes stretch. BOSTRON withstands more shock loading, needs less maintenance, and shows minimum growth even after months of operation.

Inside and out, your best buy is **BOSTRON V-BELTS** *with* **NEOPRENE**

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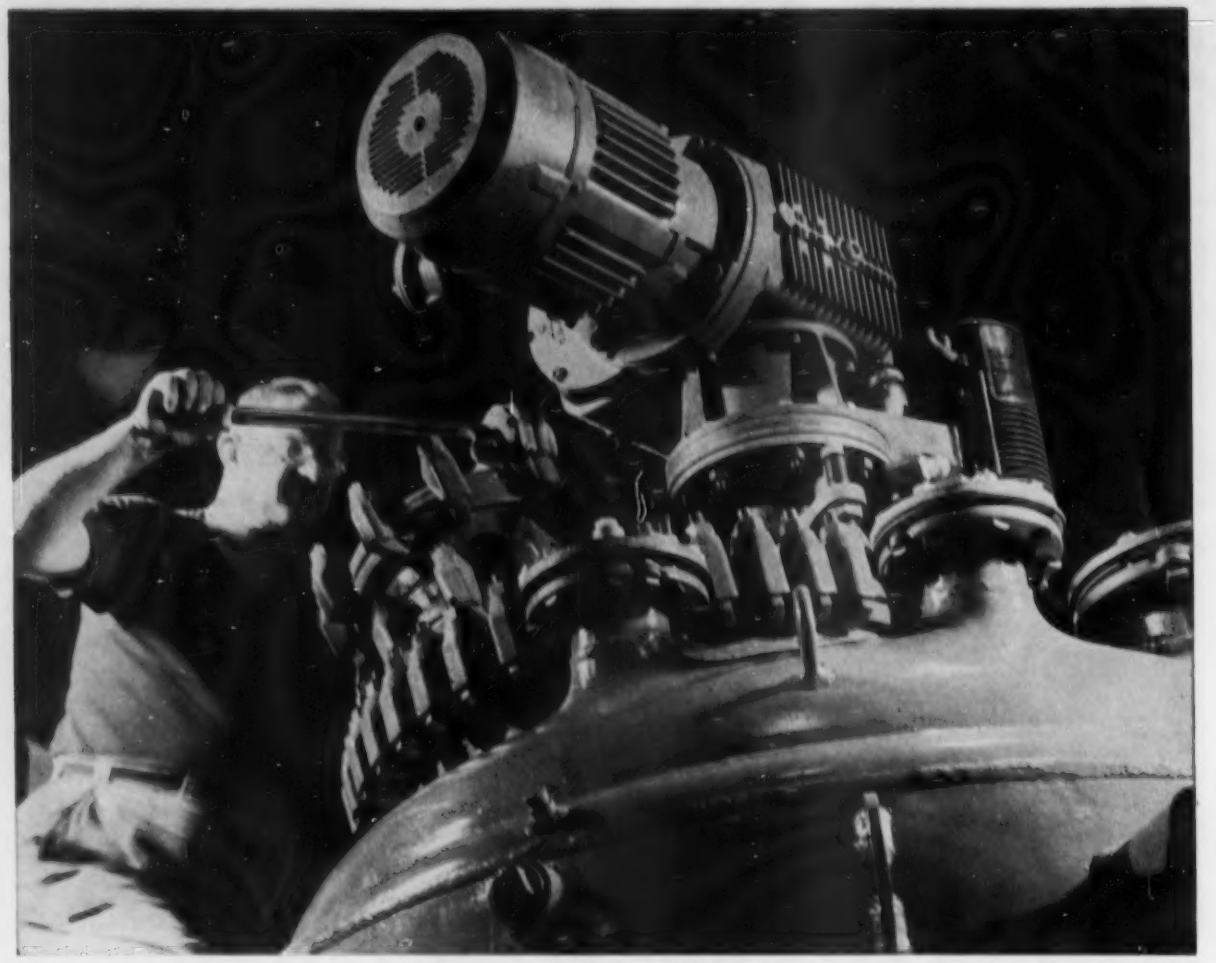

Compact, Dependable, Quiet and Powerful——

that's what The Pfaudler Co. demands of gear reducers used for the agitator drives on their glassed-steel and alloy mixing vessels. That's why Pfaudler specifies Cone-Drive double-enveloping worm gear reducers for their line of TW Agitation Drives.

Cone-Drive gear reducers are available in capacities up to 60 HP and with 27 standard output speeds from 7.3 to 525 rpm (with 1750 rpm motor). Gear reducers can be hollow-shaft or solid shaft for left-hand, right-hand or vertical mounting.

Hollow-shaft gear reducer shown in the application above has a 5" center distance and 30 HP maximum rating. Fan cooled models are available for increased thermal capacity. If maximum thermal HP capacity is required (equal to full mechanical HP ratings), water cooling coils may be installed.

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POWER
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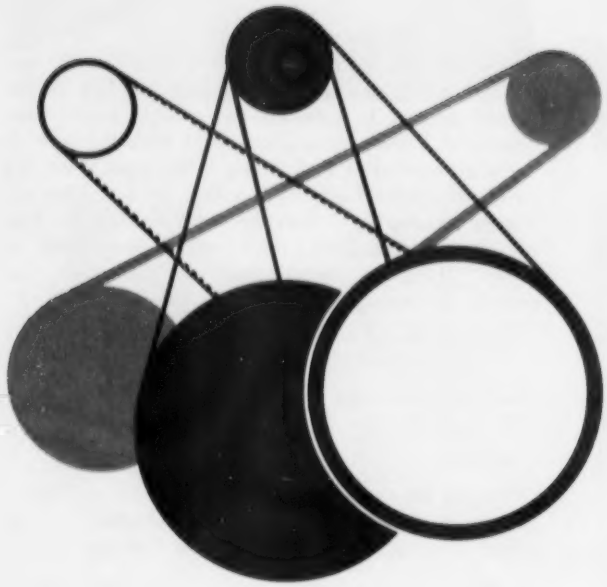
DESIGN
AUGUST 1961



What's been happening to BELT DRIVES?

FOR MANY YEARS engineers have meant V-belts when they've said Belt Drives. But things have been happening to belt drives, and those same engineers may be in for some surprises.

Not that the flat belt has replaced the V-belt. Nor does it seem likely that it will. But new materials, and advanced engineering effort have brought the flat belt into the limelight.

When positive drive (toothed) belts were fairly new, about three years ago, it was predicted that they would represent 90 percent of the total V-belt market within 6 years.

Then, about two years ago, the big news in belt drives was the narrow width (or small section) belt and sheave. They were given wide, and deserved, publicity.

Today, the most staid of all power transmission industries is again making news. Flat plastic-core leather belts were introduced into this country about 1955. They took the textile industry by storm. And they seemed likely to stay there. But further improvements—all-plastic belts, improvements in nylon-orientation, development of polyurethane coatings, and others—are toppling the established order of belt uses. The new flat belts are 6 to 10 times stronger than leather flat belts. They operate with less initial tension than the old ones, and they don't stretch continuously throughout their life. They are finding new appli-

cations throughout industry—and they seem destined to find many more.

Properly designed belt drives must include belts and sheaves. Other items, such as bearings, belt sizing, tensioners, and so on, are termed accessories. Properly applied, they can increase the efficiency of the basic belt drive.

Belts can be divided into a number of overlapping groups. Each of these has its own advantages and limitations. After a preliminary selection has been made, problems should be taken up with the manufacturers.

Flat belts—have more flexibility and less internal stress and power losses than V-belts. They rely on the surface friction between the belt and pulley to transmit the driving force. This friction in turn, depends on the belt tension. Flat belts are easily adapted to length in the field. Most of the new flat belts can be bonded in the field.

Alignment is not so important as for V-velts, nor is multiple-belt matching. Lower contact forces between the belt and pulley means they are less susceptible to abrasion. Flat belts, using new materials discussed in this article, need no takeup adjustments.

Flat belts are commonly classified by material.

- Leather
- Rubber, elastomers
- Cotton, fabrics
- Plastic-core
- Plastic-coated
- All-plastic

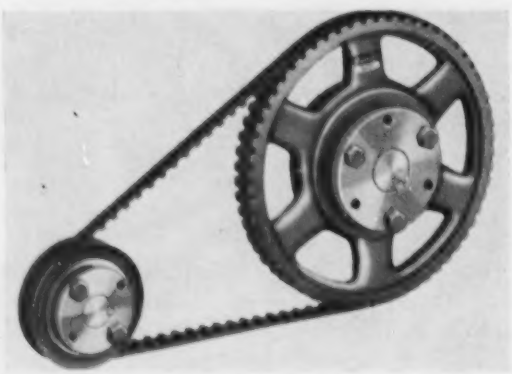
V-belts—Usually, they are grouped by form, as laid down by the V-belt Standards Association. As their name implies, they rely, not so much on the belt tension, as on the wedge action of the belt in the sheave groove, to transmit the driving force. Consequently, V-belts occupy less width than flat belts to carry an equivalent load. Since V-belt load is carried by tough reinforcing strands within the belt, they are less subject to "tear" than flat belts. Further, because of the geometric form, they are less susceptible to "snap," (impulse loads) than are flat belts. The common groupings of these belts are:

- Conventional sections (A, B, C, D, E)
- Narrow sections (3, 5, 8)
- Link-V
- Positive drive
- Controllable speed
- Multi-V (ribbed)

Despite the variations in materials used in V-belts, their performance is more closely controlled (by the V-belt Association) than is the case for flat belts.

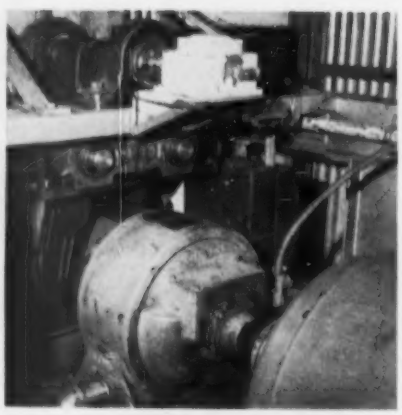
Sheaves—are either flat, or some form of V-section. The simple V-section sheaves can be fixed, or variable. Flat sheaves, like multiple-V, and other special section sheaves, are available only in fixed diameters. The name pulley is often reserved for flat belt sheaves.

Belt and sheave designs

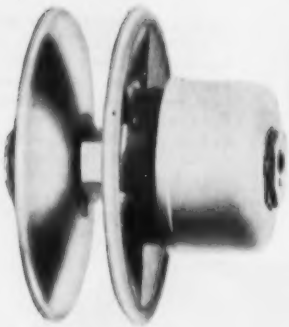


POSITIVE DRIVE takes advantage of the flexibility and low cost of belt drives, and also the high torque-transmitting qualities of gears. Gear teeth are covered with a tough wear-resistant nylon fabric. This type of belt drive is particularly suitable for applications requiring an exact drive ratio, high torque transmittal in a small space, and yet be low in cost. Introduced late 1959. *Browning Manufacturing Co.*

SMALL SECTION V-BELTS produce a speed increase of 3:1 in a test pump's drive shaft. Originally, the pump used a silent chain from the 75 hp, 1755 rpm motor to the variable speed transmission. When a higher-speed pump was installed the matched 3V belts saved an extra reduction gear. They are mounted on the same shafts as the chain drive. *Dodge Manufacturing Co.*

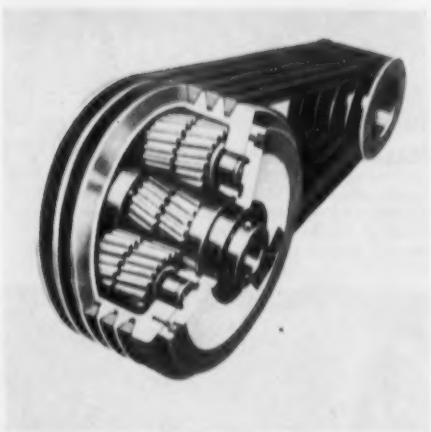


PLASTIC-CORE flat belt being bonded together. This particular belt is 16 in. wide, made up of leather, a single width of oriented nylon, and leather. There is only one company in the power transmission field making a nylon-core belt in this way. Plastics cannot take as many flexures as leather before failure. Introduced early in 1961. *L. H. Shingle Co.*

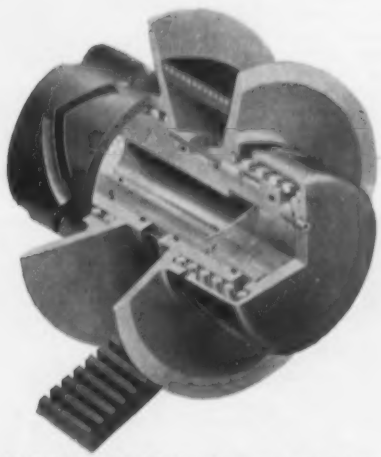


CONTROLLABLE SPEED PULLEY is made of a sheet metal stamping and glass fiber. It is lighter than previous types, and superior in strength and wear-resistance. It needs no lubrication between the nylon hub and standard steel shaft. *Rampe Mfg. Co.*

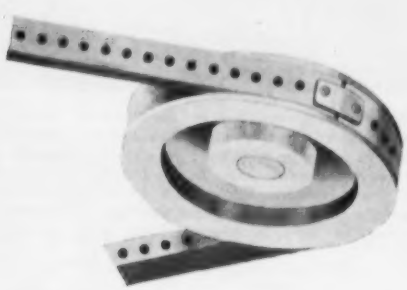
MULTI-V BELT has some of the flexibility of flat belts, some of the wedge action of V sections. Here a pump drive efficiency was increased 1½ times by substituting a multiple-V for individual matched V-belts. Drag and chafing were reduced, and takeups practically eliminated. *Raybestos-Manhatten, Inc.*



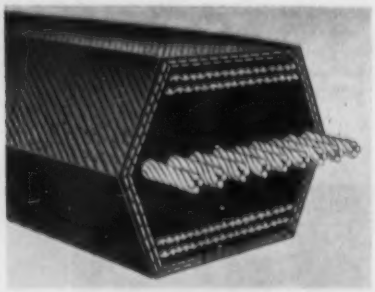
BELT DRIVEN PLANETARY gear transmission was first announced late in 1960. Speed reduction ratios of up to 270:1 are available in the rotating sheave, and further reductions of 5:1 are provided through the belt drive. *Airborne Accessories Corp.*



VARIABLE SPEED SHEAVE, as opposed to the controllable speed sheave, holds the driven sheave to a constant speed under varying torque conditions. Sidewall pressure on the belt increases with increasing load. The springs then move to maintain the set speed. *T. B. Wood's Sons Co.*



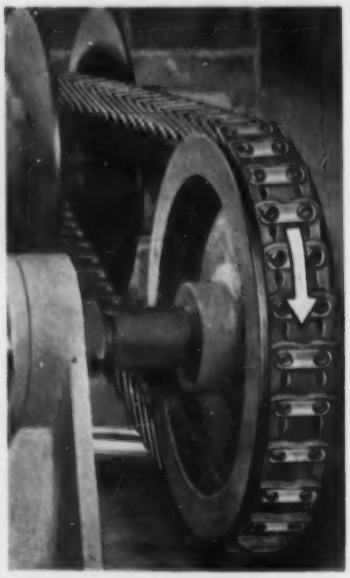
PERFORATED V-BELTS overcome a most serious drawback of conventional V-belts. They are perforated along their entire length, and may be fitted in the field. Since the holes are machine-punched at accurate 1 in. spacings, they can often be used as matched belts. Fastener for the belt is pre-bent to allow the belts to run freely over small diameter sheaves. *Rockwood Pulley Manufacturing Co.*

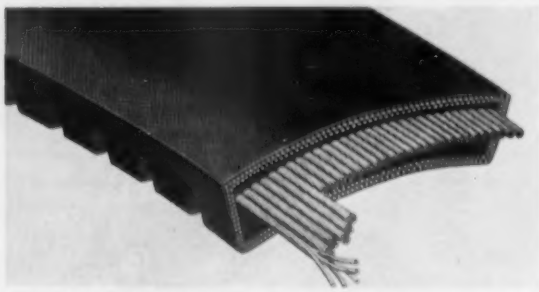


DOUBLE-V HEXAGONAL belting is designed to overcome a serious disadvantage of V belts. It can be used on short center-to-center reverse drive applications. *Dodge Manufacturing Co.*

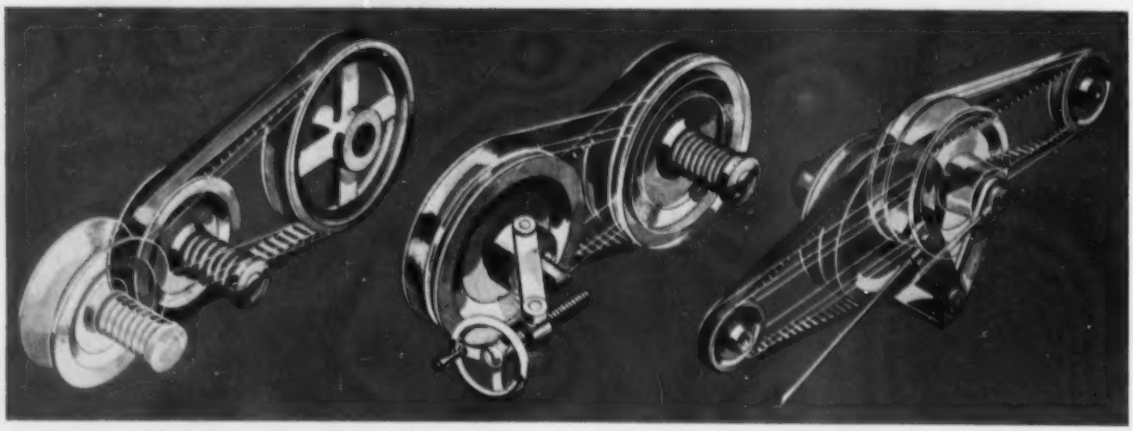
SMALL SECTION BELT AND STANDARD SECTION that transmit the same power are compared here. The small section belts use high strength fiber reinforcements and achieve a better wedging action than the standard sections. Both drives are rated for the same hp, and service factor. *T. B. Wood's Sons Co.*

LINK-V BELTING is used where obstructions (such as outboard bearings) prevent endless V-belts from being installed without dismantling the equipment. Link-V can be used in these cases without difficulty. It is made to standard V-belt section sizes, and prestretched. Each link is tested before being approved. Materials of construction include high-strength synthetic fibers, cotton and rubber. *Lovejoy Flexible Coupling Co.*



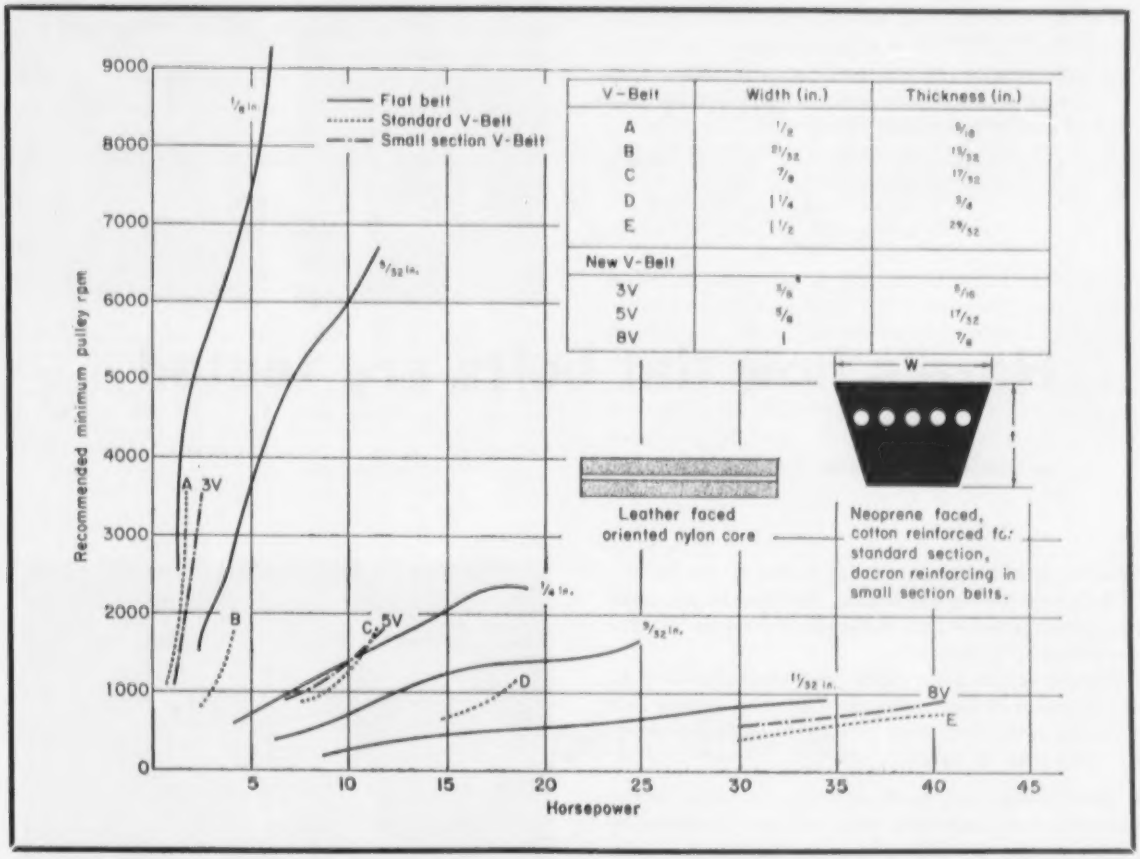


CONTROLLABLE SPEED BELT is designed to withstand the intense squeezing action of the sheave walls, while still transmitting power efficiently at all speeds. Made of synthetic rubber, they are reinforced with cotton, Nylon, or Dacron, depending on the end use of the belts. *Lovejoy Flexible Coupling Co.*



CHANGING SPEEDS WITH BELT DRIVES. Three of the commonest methods are: Left, a spring loaded controllable sheave mounted on a slideable (or moveable) support. By moving the controllable sheave to the outer (ghost) position, effective diameter is reduced and speed increased. Relationship between lateral and center movement and speed change is linear. Center: a lever-controlled sheave with a spring-controlled sheave. When both sheaves are on fixed centers, reducing the effective diameter of the lever controlled sheave allows the spring loaded one to close up (increase in effective diameter). Ratio range twice that of first case. Right: Driving and driven fixed sheaves on fixed centers. The double spring controlled sheave in the middle swings to the ghost position (right), the speed of the driven (at left) is reduced. Ratio range same as case 2.

How do the new flat belts compare with V-belts?



V-Belt	Width (in.)	Thickness (in.)
A	1/2	9/16
B	21/32	13/32
C	7/8	17/32
D	1 1/4	3/4
E	1 1/2	29/32
New V-Belt		
3V	3/8	5/16
5V	5/8	17/32
8V	1	7/8

CURVES are for belts driving at 1:1 ratio (180 deg. arc of contact). Flat belt thicknesses include leather friction facing; belts are 1 in. wide in all cases. V-belt curves derived from V-belt standards information. Flat belt curves derived from data by L. H. Shingle Co., and Extremultus Corp.

SOME FLAT BELT DRIVE applications are:

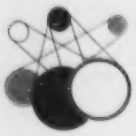
1. High-speed drives such as grinder spindles, high-speed mills, centrifuges, and blowers.
2. Drives in extremely dusty and abrasive atmospheres that cause rapid wear of V-belts and sheaves.
3. Long-center drives that require reliability, freedom from shutdown, long belt life, high efficiency, and low maintenance cost.

There are many applications for short-center flat-belt drives using pivoted or spring actuated motor bases where flat belts are competitive in performance, first cost, and efficiency. Properly selected, they transmit less shock and vibration than other drives.

For drives over 10 hp, initial cost, replacement costs, efficiency, freedom from maintenance, and ability to maintain speed are favorable to flat belts.

• **Disadvantages**—One of the most undesirable features is that the flat belt must be tight enough, even under peak load, to keep the slip below 2 percent to keep the belt on the pulley. Thus, flat belt drives must be designed to take care of the peak condition, yet operate at this tension even at low loads. This imposes larger average bearing loads and larger belt stresses. If a higher percentage of slip could be tolerated during momentary peak periods, such as starting and overloading, bearing loads and belt stresses could be lower.

Another disadvantage is noise due to the belt slapping against flat pulley surfaces. Belts with longitudinal grooves (and multi-V belts) reduce the noise.



NEW FLAT BELTS

• **V-belt drives**—Inherent advantages of V-belt drives are:

1. Belts cannot come out of sheave grooves even with excessive slippage.
2. Drives are quiet, even at high speed.
3. High gripping power of the belt results in lower total belt tension.
4. Low stretch characteristics plus increased grip allows satisfactory operation on short centers with only infrequent takeup.
5. Standardization of belts and sheaves makes initial design and maintenance easy.

Applications for V-belt drives are many, and varied. They range from fractional horsepower applications to 1000-hp drives. Generally, V-belt drives are best for the middle range of belt speeds, from 1500 to 5000 fpm. Above 5000 fpm, flat-belt drives should be investigated. Chain drives might be better under 1500 fpm.

V-groove sheaves wear rapidly in a dusty atmosphere. When the grooves lose their shape, the belts begin to wear unevenly. The second set of belts wear even more unevenly than the first. It pays to keep dirt and dust away from the drive.

For best performance, belts in a multiple groove drive must be close to the same size. Taking belts out of stock and matching them on a belt-matching machine does not insure that the belts will remain matched in service.

Here's how flat belts are tested

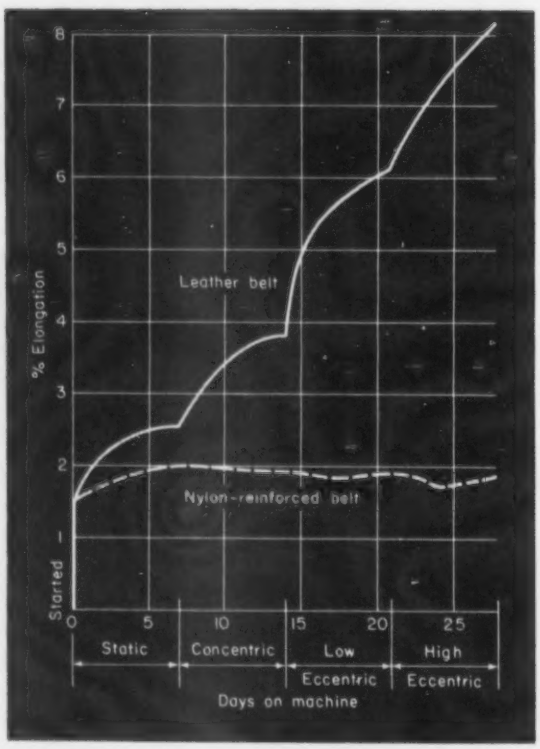
By **RICHARD H. RHOADS**, *J. E. Rhoads & Sons*

THERE ARE SEVERAL METHODS in use at our laboratories for testing flat belting. Perhaps the two most significant, however, are those which compare relative elongations and capacities.

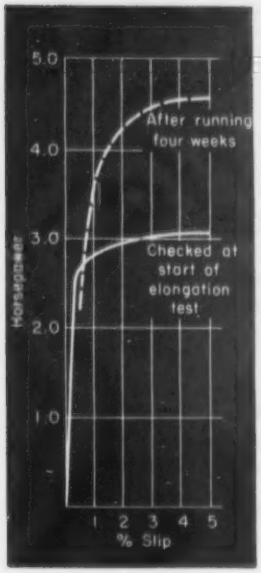
Elongation has been the biggest single problem in the operation of flat leather belts on short centers and work has been continuing intensively on this problem for more than 25 years.

• **Stretching**—Any given segment of a power transmission belt is alternately tensioned and slackened as it runs around the pulleys from the tight to the loose strand. There is, in consequence, a jerking action on each segment of the belt. This jerk appears to be more of a cause for short life and belt elongation than the wear from rubbing against the pulleys or the flexing. The standard elongation test uses endless belts in groups of four. This we consider a minimum representative sample. The belts are placed around two pulleys for a week. The lower pulley is free to swing around a pivot so that its full weight of 60 lb is applied to the 1 in. wide belt. The second week the pulleys are rotated. The third week the belts are run over pulleys which are 3/32 in. eccentric and the final (fourth) week, over pulleys 3/16 in. eccentric. The length of the belts are measured each day and plotted on a graph (right). With a typical leather belt, the elongation is greatest as it moves into each new step of the test and then tends to level out.

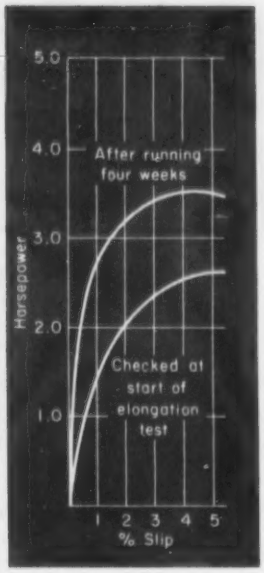
• **Power**—Our laboratory also tests for horsepower capacity on a dynamometer. The horsepower that a



COMPARISON SHOWS the radical reduction of stretch in the new oriented nylon-reinforced flat belts. Leather belt is a 1 in. by 60 in. center stock oak tanned belt. The plastic-cored belt is Rhoads 1 LB Tanastic belt, also 1 in. by 60 in. endless.



UNTIL the introduction of polyurethane coatings for belts, leather had the best available friction characteristics for flat belts. Horsepower carrying capacity of a typical center stock oak tanned belt increases with use.



INCREASE in horsepower carrying capacity of the nylon core belt is due to the fact that the leather friction surface improves with use. Compare the hp that can be carried by a 1 in. wide flat belt with small section V belts.

belt can transmit under controlled tension and at varying rates of forced belt slippage is measured at the start of the elongation test and again towards the end (see graphs left). The effect of wear on belt capacity is noted. Tests show that the capacity of the belt improves with use. This type of test is the best method of duplicating severe drive applications. Any belt which performs well on these tests can be counted on for difficult industrial applications. Further, a belt which has been through this test appears as well worn as one which has been used for many years on a difficult industrial application. Many belts break or have the lap come loose during the high eccentric drive phase of testing, but good belts do survive it.

The typical curve for nylon reinforced leather belting shows virtually no permanent stretch which cannot be adjusted by making the belt 2% short of the "tape line length." Even in these cases, the capacity of the belt improves throughout its life.

• **Other tests**—These are only two of many hundreds of tests which have been run over recent years. They supplement others comparing elongation, hysteresis, relative flexibility, tear strength of laps, adhesion of leather to leather and leather to plastic. Our development program would be severely handicapped without tests such as these. They show, quite clearly, when progress is and is not being made.

How to size belt drives

THE BEST BELT IN THE WORLD becomes useless—even dangerous—if it is improperly sized for its job. Yet belts have been designed so that their selection, for most applications, takes but a few minutes.

Sometimes the location of the sheaves is fixed. Here, open-ended belts must be used (N.B. Many flat belts can be made "endless" in the field, with joints that are stronger than the belt itself.). In most applications, one or both sheaves may be located so as to accommodate a standard sized endless belt. In many of the fixed-center applications, idlers can be used to accommodate standard endless belts.

All the information that is needed to choose the right belt is:

- Hp requirements
- Speed of driving pulley
- Sheave center distance
- Type of driver and driven units
- Any special performance requirements (varying speed, etc.)

Horsepower is used in determining the cross-section of the belts to be used, for any given type of belts.

Speed is used chiefly to decide on the type of belt, and in sizing the sheaves.

Sheave center distance is needed to fix the length of belt, but may also indicate belt type.

Driver and driven units are used to determine load factors which can be very important to the life of the belt.

Special performance requirements are, obviously, to see if special equipment is needed.

Sizing flat belts

Finding the smallest pulley diameter for the job—From the smallest pulley speed (rpm), the belt

speed in ft per min is found by the following calculation:

Belt speed = pulley diam x rpm x 0.262

From the curves the thickest belt that can be used with the smallest pulley should be selected.
From the curves on page 23, or from the manufacturers hp capacity tables, determine the capacity of the selected belt.

Note: Remember to correct the hp capacity by the arc of contact factor where necessary. Arc of contact can be found from:

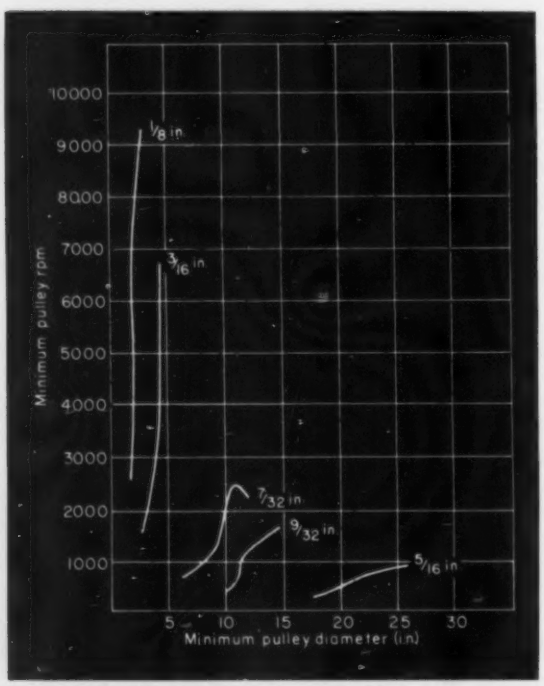
$$\text{Arc of contact} = 180° - \frac{57.3\ (\text{difference in pulley diams})}{\text{center distance}}$$

All measurements in inches

Now to fit the belt to the particular application, divide the hp requirements by the calculated corrected hp capacity. This will give the required width of belt. Flat belt manufacturers warn that although a narrower belt could be used, the life of such a belt would be considerably curtailed. The table at the top of the next column shows the effect of using an overloaded belt.

Finding the length of flat belt required—From the formula

$$L = 2S + 1.57\ (D + d) + \frac{(D^2 - d^2)}{4S}$$



MINIMUM PULLEY RPM increases, generally, as minimum pulley diameter decreases.

Belt Capacity as percent of load	Life expectancy as percent of rated life
110	140
100	100
90	65
80	41
70	23
60	13

Where L is required belt length
S is span between pulley centers
D & d are larger and smaller pulley diameters respectively

Note: Manufacturers tables suggest an additional length to account for initial tension. As this varies with manufacturer, and from belt material to belt material, these tables ought to be consulted

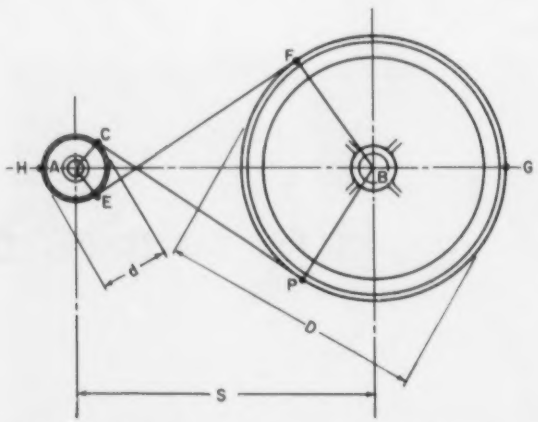
Where crossed belting is to be used—the calculation of length is more complicated

Required belt length = EHC PGF E

Angle FBP is found from

$$\text{Cosine ABP} = \frac{(D - d)}{S};\ \text{Hence Angle FBP}$$

From Angle FBP, the ratio of belted circumference to unbelted circumference can be found



BELT DRIVE LAYOUT for determining crossed belt length.

$$\frac{\text{Larger Angle FBP}}{360\ \text{deg}} \times \text{circumference} = \text{length of belt FGP}$$

Similarly, the length of belt around the smaller pulley can be found

From simple trigonometry, length of CP = EF = AB Sine ABF. So total length of belt =

$$2\ (\text{AB Sine ABF}) + \pi D\ \frac{(\angle \text{FBP})}{360\ \text{deg}} + \pi d\ \frac{(\angle \text{BAC})}{360\ \text{deg}}$$

Determining proper tension in the new flat belts—(Urethane coatings will reduce the initial tension below even these values—see manufacturers' tables)

For each 1 percent of belt stretch, use the tensions shown below. These figures are for leather-faced, oriented nylon-cored belts.

Belt thickness in.	Belt tension lb.
1/8	40
5/32	60
1/4	110
9/32	135
11/32	175

Sizing a special section belt—V-belts, positive drive, multi-V, controllable speed, etc.

- Consult the manufacturers' tables to determine the Drive Service Factor.
- Multiply the rated hp of the drive unit by the service factor for the driven unit.
- From the manufacturers' tables again, find the appropriate belt section. For a preliminary guide, use the graph on page 23.
- Select the sheave diameters to give the required speed ratio, from the manufacturers' tables.
- The correct belt length is also covered in the tables.
- To determine the number of belts needed, divide the corrected driving hp for the application by the belt's rated hp capacity.

Minimum recommended idler diameters—Idlers can be used where it is not possible to provide movement of either the Driver or Driven Unit. Where idlers are used, increase the service factor by 0.1 to 0.2. As a rule, the use of idlers on the outer face of V-belts is not recommended. The reverse bending so created reduces the life of the belt. Grooved idler sheaves operating on the inside of the belt, and on the slack side of the drive are preferred. Inside idlers reduce the arc of contact, and allowance must be made for this in belt selection.

Idlers should be placed near the driving sheave when used on the slack side and near the driven sheave if used on the tight side. On drives where belt vibration is a problem place the idler at one-third the center distance from the driver to minimize this effect. Generally, the largest possible idler diameter decreases the belt life by the least amount.

IDLER LOCATION	BELT SECTION	IDLER PITCH DIAMETER ON SLACK SIDE IN.	IDLER PITCH DIAMETER ON TIGHT SIDE IN.
Inside Idler	A	3.0	4.0
	B	5.4	7.0
	C	9.0	12.0
	D	13.0	18.0
	E	21.0	28.0
Outside Idler	A	4.0	4.4
	B	7.0	8.0
	C	12.0	13.0
	D	18.0	20.0
	E	28.0	32.0

BY COMPARING THESE IDLER DIAMETERS with the minimum recommended diameters for conventional section belts, and using this same ratio, suitable idlers can be selected for narrow section belts, or other special cases.

APPLICATION IDEAS FOR BELT DRIVES

Here's a guide to some of the belt drive ideas published during the last year in POWER TRANSMISSION DESIGN

FLAT BELT TAKES SHOCK LOAD WITHOUT SLIP ....July, 1960
Sudden acceleration, 12 ft centers and high torque made belts slip on an auger-equipped crane. Cure was a 9 in. flat belt of polymer with a leather friction surface.

COMPACT V-BELTS HANDLE HIGH INERTIA .....Aug, 1960
High inertia load of a carnival ride drive wore out engine clutches in a few weeks. A combination drive of compact and standard V-belts solved all problems.

REDESIGNED DRIVE, MOTOR MOUNT, GIVE LOW MAINTENANCE OPERATION .....Sept, 1960
Power saw drive system uses a new concept of motor mounting and a speed change cone with a fiberglass and teflon bearing surface.

LOW MAINTENANCE BELT DRIVE IS SIMPLE AND EFFICIENT .....Sept, 1960
A variable speed drive provides infinitely variable spindle speeds on a cylindrical-die thread rolling machine.

POLYMER BELTS PASS TORTURE TEST .....Oct, 1960
A belt wrapper for coiling metal strip gives severe punishment to a polymer belt.

TOOTHED BELTS DOUBLE AS CONVEYOR BELTS ....Oct, 1960
An unusual job for a toothed belt is to convey paper-board sheets through a collating machine.

COMPACT V-BELTS REDUCE BEARING OVERHANG Nov, 1960
A Stump-Gobbler tractor attachment chews up tree stumps in ten minutes. Use of a new compact drive reduced bearing overhang, increased efficiency.

V-BELTS DRIVE HIGH SPEED DRILLS .....Apr, 1961
Eighteen motors V-belt drive 36 drills in a pipe perforating machine. Spindle speeds of 3898 rpm for only 105 degrees of belt contact.

FLAT PULLEY IS V-BELT SPEED CONTROL .....June, 1961
An unusual speed control method on an end-rolling machine, by changing the pitch at which belts engage the sheaves of the variable pulley.

BELT SELECTION GUIDE

BELT SELECTION GUIDE

COMPANY	FLAT BELTS								V-BELTS				SHEAVES & PULLEYS			MAX HP	
	LEATHER	FABRIC	RUBBER	PLASTIC CORE	ALL PLASTIC	PLASTIC COATED	MULTI-V (RIBBED)	POSITIVE (TOOTH) DRIVE	CONVENTIONAL (A, B, C, D, E) SECTIONS	NARROW (3V, 5V, 8V) SECTIONS	CONTROLLABLE SPEED (VARIABLE)	LINK-V	FLAT	V, FIXED PITCH	V, CONTROLLABLE PITCH	UNDER 50	OVER 50
ALLIS-CHALMERS MFG. CO.														●		●	●
AMERICAN PULLEY CO.									●	●			●	●	●		●
CHARLES BOND CO.	●												●	●		●	●
BARKE PRODUCTS INC.								●	●	●		●		●	●	●	
BONNER AND BARNEWALL INC.		●				●										●	
BOSTON WOVEN HOSE & RUBBER DIV., AMERICAN BILTRITE RUBBER CO.			●				●		●	●						●	●
BRAMMER CORP.												●				●	
ARTHUR S. BROWN MFG. CO.		●	●			●				●						●	
BROWNING MFG. CO.							●	●		●		●		●	●	●	●
CHICAGO ALLIS MFG. CORP.	●			●												●	●
CLIMAX METAL PRODUCTS CO.									●	●			●	●	●	●	
CONGRESS DRIVES, TANN CORP.									●					●	●	●	
DAYCO CORP., INDUSTRIAL PRODUCTS DIV.								●	●		●					●	●
R. & J. DICK CO.		●		●	●	●		●	●	●	●	●		●		●	
DODGE MFG. CORP.									●	●	●	●	●	●	●	●	●
DURKEE-ATWOOD CO.									●			●		●		●	

EXTREMULTUS INC.		●		●	●	●										●	●
FORT WORTH STEEL & MACHINERY CO.							●		●	●		●	●	●	●	●	●
GATES RUBBER CO.		●	●							●	●	●		●		●	●
GERBING MFG. CORP.											●			●	●	●	
GLOBE WOVEN BELTING CO.		●	●			●										●	
B. F. GOODRICH INDUSTRIAL PRODUCTS CO.		●	●		●	●	●		●	●	●	●				●	●
GOODYEAR TIRE & RUBBER CO.			●				●	●	●	●						●	●
HEWITT-ROBINS INC.		●	●											●		●	●
LEWELLEN MFG. CO.			●								●		●	●	●	●	●
LOVEJOY FLEXIBLE COUPLING CO.											●	●	●	●	●	●	
MANHEIM MFG. & BELTING		●										●				●	
MAUREY MFG. CORP.							●	●	●	●	●	●	●	●	●	●	●
MORSE CHAIN CO.								●								●	
NAGEL-CHASE MFG. CO.														●		●	
PIC DESIGN CORP.		●														●	
PAGE BELTING CO.	●	●		●	●				●							●	●
RAMPE MFG. CO.															●	●	
RAYBESTOS-MANHATTAN, MANHATTAN RUBBER DIV.							●		●	●	●			●		●	●
REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CO.		●	●						●		●					●	●
J. E. RHOADS & SONS	●			●												●	●
ROCKWOOD PULLEY MFG.							●	●	●	●	●	●	●	●	●	●	
RUSSELL MFG. CO.		●	●		●	●		●								●	
SALEM STAMPING & MFG.														●	●	●	
L. H. SHINGLE CO.	●	●		●	●	●										●	●
SPEED SELECTOR INC.											●			●	●	●	
U. S. RUBBER CO.		●	●					●	●	●	●	●				●	●
WESTERN IRON & FOUNDRY CO., INC.														●		●	●
T. B. WOOD'S SONS CO.							●	●	●	●	●	●	●	●	●	●	●
WORTHINGTON CORP.								●	●		●	●		●	●	●	●

Belt drives/case histories

Belts, whether they are flat, ribbed (multi-V), or any other type, provide a quiet, resilient form of power transmission. They can be used through an extensive range of horsepowers, speeds and industries, if properly selected.

Some of the recent developments have led to the following case histories, which all point out improvements in belt drive practices.
Which of these ideas can you adapt for your own use?

NEW AUTOMOBILE WITH A PROBLEM

Courtesy Raybestos-Manhattan

CORVAIR'S BELT DRIVE has four quarter turns, an idler, operates continuously at temperatures over 100 degrees.

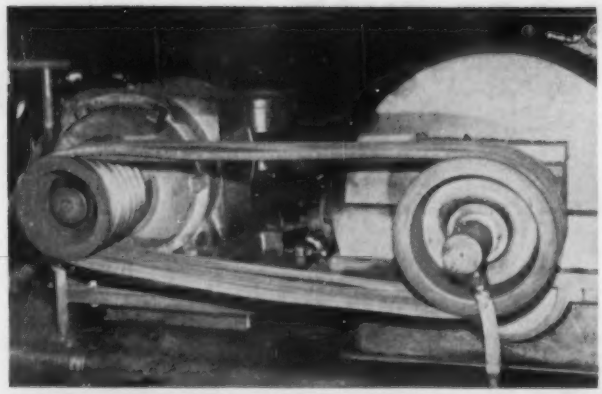
The Corvair's belt life is reportedly something like 2000 miles, due to its very tortuous drive pattern. The V-belt is driven by the main engine shaft. Power is transmitted to the generator, and to the air-cooling system (Top of the engine, blowing air down through the engine). The system also includes an idler that changes the direction of the belt.

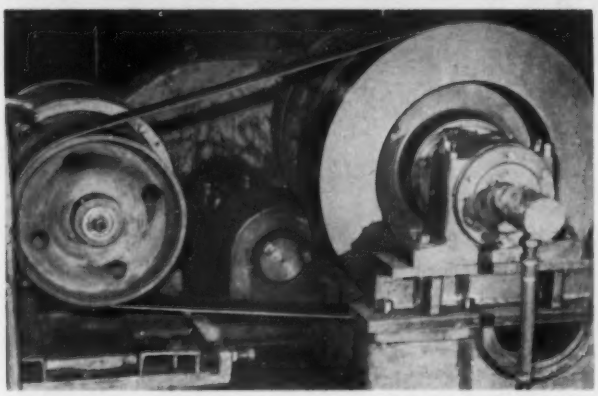
In a manufacturer's test car, using a multi-V (ribbed) belt, all belt skipping has been eliminated, and the car has so far traveled over 5000 miles without belt damage or adjustment. "The problem," says James Adams, Jr., Chief Engineer of Raybestos-Manhattan, Inc., "was that the plain V-belt was too inflexible. And we feel that ordinary flat belts could not drive the generator with the 90 degrees of contact that the drive allows. The multi-V belt has both the flexibility of the flat belt and the wedge action of the V-belt."

Corvairs are still using a V-belt. The May 1961 news letter for this car suggests that over-tensioning causes the poor belt life. New recommended tension is 50 lb.

STROBOSCOPE ANALYZES SHAFT LOADING

Six standard section V-belts were in use, driving a 500 ton car body press. Belt speed was 3300 ft per min. The shaft was highly loaded, and the bearings needed frequent attention. Stroboflash pictures revealed that the belts had stretched unevenly, so that they had uneven tension distribution. This, in turn,





OPERATING AT 3300 RPM on 8 in. to a 14 in. sheave, the press uses a motor rated at 70 hp. Replacement pulleys were 20 in. and 35 in. in diameter, and 4 in. wide. Pictures taken with a stroboflash unit at 1/5000th of a sec.

Courtesy Extremultus Corp.

generated vibrations and high shock loads in the shaft and bearings.

The problem was solved by replacing the multiple belts with a single 4 in. wide flat belt. Belt speed is now 7600 ft per min, and belt tension was reduced by about 60 percent. Since the flat belt is considerably narrower than the old V-belts, the pulley is closer to the shaft bearing. Shaft overhang is reduced by about 30 percent.

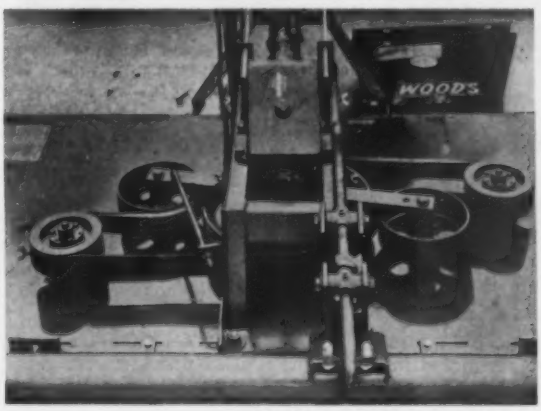
Because of the high shock loads characteristic of this type of equipment, the V-belts were being jammed into their grooves. This caused unduly high tensions in them, causing the high shaft loading. Belt life has been considerably extended by the new design.

ROUGH HANDLING, AND LITTLE CARE

Despite rough use, and the lack of maintenance that is common in the unskilled labor field, the V-belts on a rotary mower function perfectly. The mower can double, when necessary, as a corn shredder, and the drive system takes the shocks over the rough ground without effort. The idlers here are used to increase the angle of contact on the blade pulley. This provides the extra high power necessary to sweep aside earth and rocks in the cutter's path.

ROTARY MOWER uses V-belts in transmission system. The belts function satisfactorily despite rough use, little maintenance.

THREE BELTS drive this corn shredder. Reverse idlers are used without damage. Tension control is simplified with a lock nut.



Photos, courtesy Dayton Rubber Co.

Diesel hydraulics can push diesel electrics

By **H. E. MARTIN,** *New Product Development Engineer, General Motors Diesel Ltd., London, Ontario.*

FIG. 1. DIESEL HYDRAULIC LOCOMOTIVE claims to have a wider operating range than the diesel electric.

DIESEL HYDRAULIC LOCOMOTIVES perform similarly to diesel electric locomotives. Yet, there are differences because of the different transmission systems. Several advantages are claimed for diesel hydraulic over diesel electric:

1. Ability to work at higher values of adhesion. Bogie axles are geared together on diesel hydraulics, and independently powered on conventional diesels.
2. Wider operating range. Most diesel hydraulic transmissions allow full throttle engine horsepower over a greater portion of locomotive speed range.
3. Higher capacity for low-speed dynamic braking.
4. More effective transmission cooling, and ease of increasing the cooling capacity.
5. Completely sealed transmission system. This gives a potential for less maintenance and greater reliability.
6. Inherent wheel-slip protection.

Steam, Electric . . . . Hydraulic?

When the diesel electric was introduced, it had little difficulty in making the steam locomotive obsolete. Perhaps the diesel hydraulic will start a new phase in locomotive power. However, diesel hydraulics don't demonstrate advantages like those of the diesel electric when it replaced steam.

An 800-hp diesel hydraulic locomotive, Fig. 1., can be assembled in a multiple unit to provide a locomotive for applications requiring higher horsepower.

In a typical diesel hydraulic transmission, Fig. 2, power flows from right to left. A disk coupling connects the engine to the converter section housing and drives. The torque converter is a single-phase, multiple-stage type. The retarder rotor splines directly to the turbine output shaft. The retarder housing, with cast reaction vanes, encloses the rotor. This cavity is filled with oil only during braking. It's empty during normal locomotive operation.

Which Transmission Is Best?

The constant-mesh, planetary-transmission section provides four gear ratios. The transfer gear unit at the rear drops the drive line and changes the drive direction. It also provides several auxiliary power take-off points and contains the main oil sump.

For locomotives, the arrangement in Fig. 2 has been altered slightly. The reverse planetary set, which provides only two reverse ratios, is removed. A reverse gearing and a claw-type clutch are added to the transfer gear case to give four equal gear ratios for both forward and reverse operation.

Fig. 3 shows a simplified cutaway view of the converter and transmission sections. The converter operates as a hydraulic torque multiplier and a hydraulic coupling. It consists of four elements: Pump, turbine, first stator, and second stator. Torque multiplication at stall is 2.53:1 with a 400-hp engine and 2.70:1 with a 275-hp engine. In the high-speed low-torque end of each gear range, the converter functions as a fluid

coupling. This occurs when turbine speed approaches pump speed, causing the stators to freewheel in the direction of pump and turbine rotation. The result is increased efficiency in this speed range. Another feature which increases the efficiency at the top speed of 2nd, 3rd, and 4th gear ranges is lockup. Lockup connects the engine directly to the transmission. Lockup also extends the top speed in each range.

The Components

The transmission uses three planetary gear sets. They consist of the splitter planetary, low range, and intermediate range planetaries. The splitter planetary operates at two speeds, direct and overdrive. The range planetaries are interconnected to act as a compound gearing. Four drive ratios are obtained by using combinations of low-direct, intermediate-direct, direct, and overdrive. They are 4.00:1, 2.01:1, 1.00:1, and 0.67:1.

Splitter and range clutches are multiplate. They are hydraulic-applied, spring-released, oil-cooled friction clutches. The design operates effectively throughout the life of the clutch plates without adjustment. Friction plates are steel with sintered bronze faces. Reaction plates are hardened steel.

The hydraulic system comprises the valves, pumps, lines, filters, coolers, and controls. A combination oil pressure and scavenge pump is at the lower front of the transmission. It is a dual gear pump with two seperate pairs of gears always connected to the engine through a spur-gear train. The larger pair of gears comprises the input pump which supplies oil under pressure to the hydraulic system. The smaller pair of gears comprises the scavenge pump which draws oil from the low part of the converter housing and returns it to the sump.

Fig. 4 shows a final gear box opened along the axle center-split line. Input from the cardan shaft is through a drive flange and spur gear in the top portion of the box (not shown). This gear meshes with the spur gear (shown) which is shrunk onto a tapered section of the spiral bevel pinion shaft. The spiral bevel gear is mounted on a hub which is shrunk on the locomotive axle. All bearings are the anti-friction type. A gear pump lubricates all gears and bearings. Also, it circulates enough oil to equalize temperature. ◆

Based on a Society of Automotive Engineers Paper.

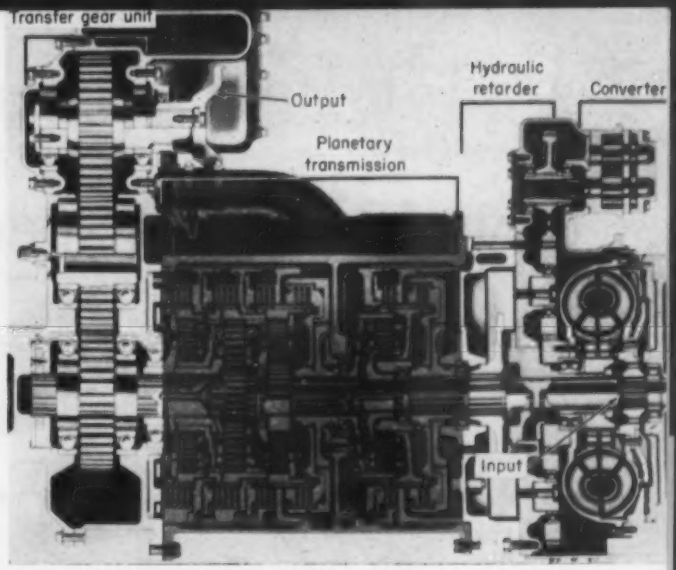


FIG. 2. TYPICAL DIESEL HYDRAULIC transmission requires less maintenance than diesel electric.

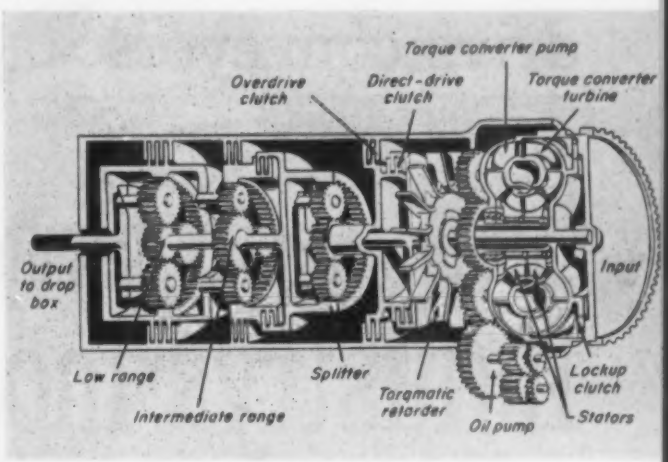


FIG. 3. SCHEMATIC CUTAWAY of diesel hydraulic transmission shows the basic elements.

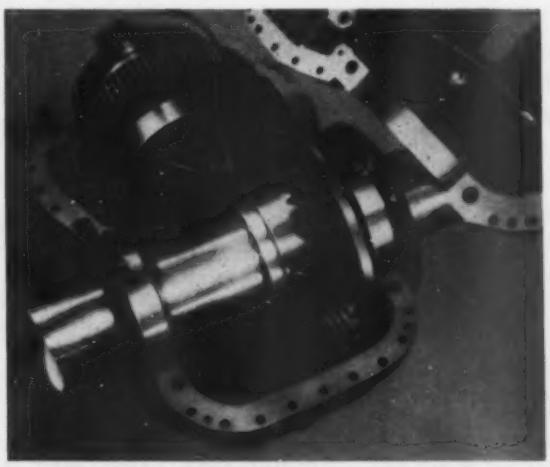
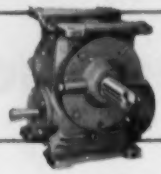
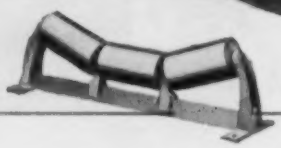
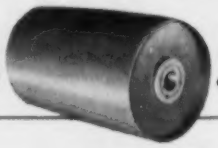


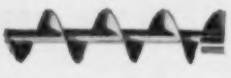
FIG. 4. FINAL GEAR BOX opened along the axle center-split line shows the final drive gears.

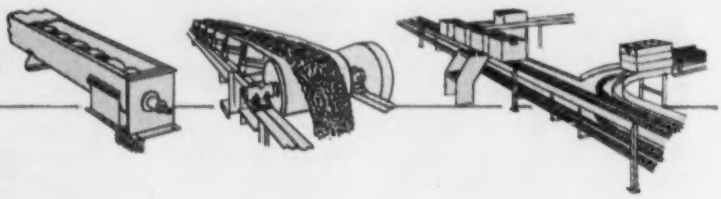
Link-Belt products go together...

power through speed reducers  ...

and sprockets . These products

... idlers  ... pulleys  ...

screw conveyors  ... and other

drive conveyors 

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The *right combination* of drive components is necessary to give you maximum efficiency with minimum operating cost . . . minimum *total* cost. Your Link-Belt distributor has everything you need to keep your plant production rolling, whether your requirements are simple or complex. You can depend on him to make recommendations that are unrestricted by line limitations. For full information and literature on industry's most complete line of related power transmission products and conveyor-elevator components, call your nearest authorized stock-carrying distributor or Link-Belt office.

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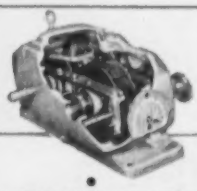
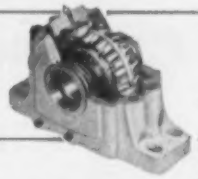
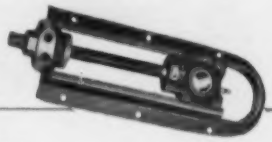
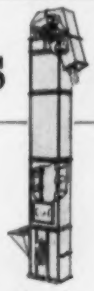
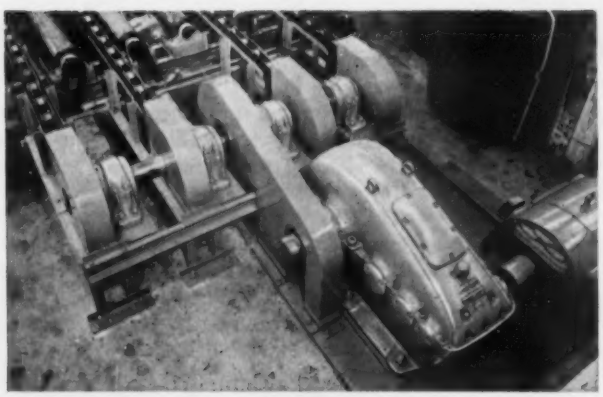
Couplings join shafts to transmit variable speed drives  . . . chains are combined with bearings  . . . takeups  . . . components for Link-Belt products*...to make up and bucket elevators  and other equipment

complete one-source service



LINK-BELT PRODUCTS GO TOGETHER — the conveyor above uses these standard Link-Belt products: **(1)** flexible coupling; **(2)** triple-reduction parallel-shaft speed reducer; **(3)** RC roller chain drives (encased); **(4)** roller bearing pillow blocks; **(5)** SS conveyor chains and sprockets.

LINK-BELT

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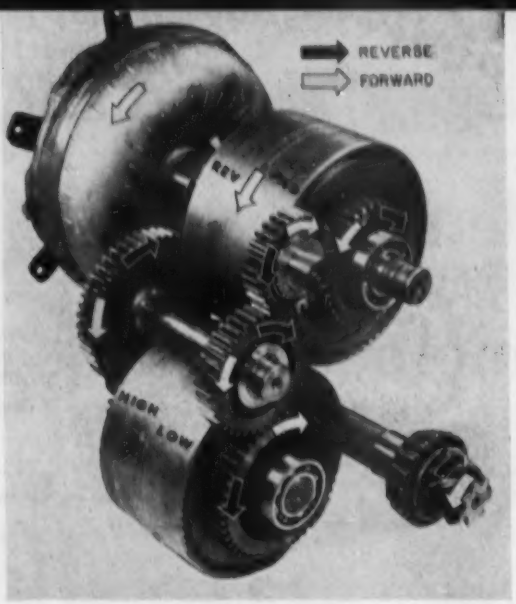
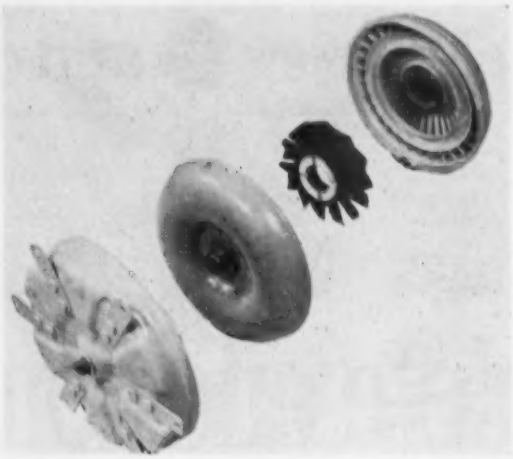
Transmission combines torque converter with power shift



TRANSMISSION ASSEMBLY consists of torque converter, heavy-duty clutch packs and constant-mesh gears.



EXPLODED VIEW of torque converter which supplies high torque for industrial trucks.

A TORQUE CONVERTER driving through low-speed transmission gears supplies high torque for industrial trucks. Typical operations requiring high torque: Starting on ramps, inching under loads. Torque multiplication of 2.2:1 is available for severe requirements. Low-torque requirements and higher speeds can be obtained with the high-speed gears and automatic converter adjustment. The converter is an efficient fluid coupler when load torque equals engine torque.

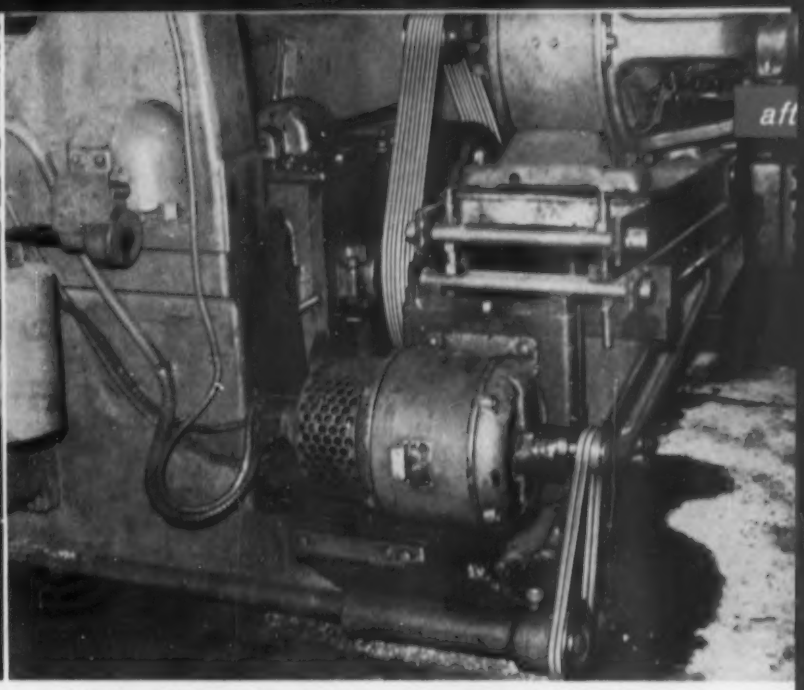
The transmission has 2 speeds forward and 2 speeds in reverse. Gears are in constant mesh. Four heavy-duty clutch packs are used for shifting to each speed or direction without reducing power. Clutch plates have a lining of sintered bronze. They run in an oil bath. Two levers mounted on the steering column control the clutch operation. These levers actuate hydraulic valves. The valves supply pressure fluid to the clutch packs when changing speed or direction.

An inching control enables the driver to speed the engine for maximum lifting power while he inches into position with the load. The inching system contains an oil-pressure control spool that meters oil flow to forward and reverse clutches. The driver depresses the brake pedal slightly to start oil flow. The slight brake-pedal travel does not actuate any part of the braking system. This avoids any brake wear during the inching operation. The driver controls the truck at all times. He needs only to depress the brake pedal further to cut inching and apply the brakes.

A hydraulic pump charges the torque converter with oil and develops pressurized lubrication for the converter and transmission. An integral oil cooler cools the transmission by recirculation. The cooler is a sump tank on the vehicle radiator. The transmission was designed jointly by Baker Industrial Trucks, Cleveland, and the Long Mfg. Div., Borg-Warner Corp., Detroit. ◆

Gates

Industrial News



Gear drive caused chatter marks on parts

Gates Super HC High Capacity Drives replace gear and flat belt drives

GATES SUPER HC DRIVE REPLACES GEAR DRIVE IN LIMITED SPACE...

ends costly rejects

Chatter marks on parts produced by a vertical boring mill at Manitoba Bridge and Engineering Works, Ltd., in Winnipeg resulted in costly rejects. The cause of the chatter marks was traced to the gear and pinion on the main drive.

About a year ago, the plant engineer investigated the possibility of replacing the gear drive with a flat belt or conventional V-belt drive. However, to do the job, both types of drive had to be too large to fit into the limited space available.

Advised by a Gates Representative, he then designed a Gates Super HC High Capacity Drive for the boring mill. He found that the high capacity Gates Drive was so compact that it could readily transmit the required power in the space vacated by the gears. Now, with the smooth-running Gates Drive, the mill is turning out clean, even cuts, eliminating chatter marks.

The Gates Fieldman located near you is a drive design expert. To contact him for help in designing a new drive, or for quick delivery of replacement V-belts, call your nearby Gates Distributor.

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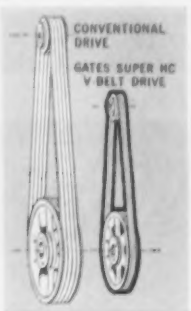
Designing a new Drive?

Gates High Capacity Drive saves space and money ... cuts bearing loads



When you design a new drive or replacement drive, you can save space, weight and money by using a Gates Super HC V-Belt Drive—the first and most advanced high capacity drive. Because of exclusive design features, this new Gates Drive can often transmit the required horsepower in about half the space needed by a conventional V-belt drive—with fewer belts and smaller sheaves.

Drive costs are reduced as much as 20%. Drive weight is reduced 20% and more. Guards and machine housings can be smaller, shafts shorter. Reduced weight and overhang on bearings cut bearing loads. Moreover, the Gates Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing!

Need replacement V-belts?

Why Gates Hi-Power V-Belts are industry's No. 1 choice today

The exclusive construction features of Gates Hi-Power V-Belts—Concave Sides, (U.S. Pat. 1813698) Precisely-Engineered Arched Top, Flex-Bonded Tensile Member—make them more dependable than ordinary conventional V-belts, giving you far longer belt life on even the toughest applications.

Moreover, because of Gates high standards of quality control, you get a perfectly matched set of Hi-Power V-Belts every time—every belt pulls its share of the load throughout the long service of the drive, further increasing belt life.

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Simple, isn't it?

— and the time it saves!

Save an hour, two hours, three hours per change, and *you* figure what Taper-Lock mounting is worth to you!

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Taper-Lock mounting is one of the plus features of Dodge sheaves, sprockets, couplings, conveyor pulleys. Ask your Dodge Distributor, or write us for bulletin.

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The Products with the Pluses...

DODGE

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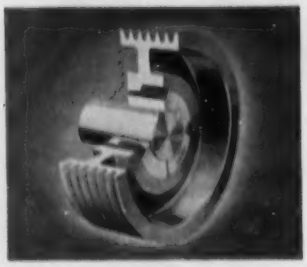
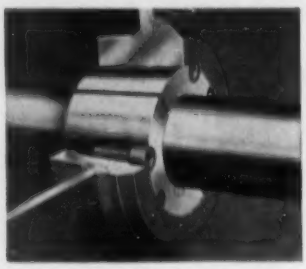
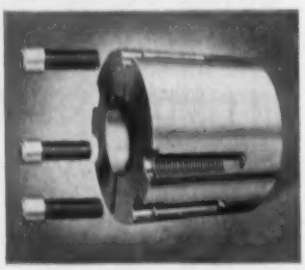


No flange, no collar, no protruding part! Modern, safe, *flush* design. Minimum space on shaft. Mounts as a unit — tighten while sighting. Easy on — easy off!



Bearing surface runs the entire length of the hub and bushing. Full compression means extreme holding power. No wobble. Taper-Lock runs true!



Interchangeable bushings. Change from shaft to shaft, from one size to another, from sheaves, to sprockets, to couplings, to pulleys. Talk about inventory economy!

Circle **37** on Reader Service Card

Open sesame for the world's largest doors

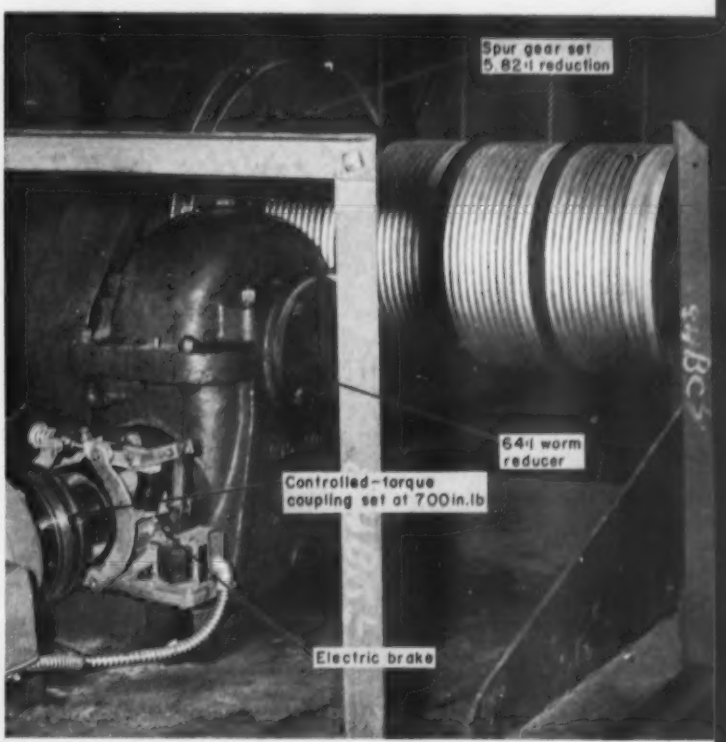
The treasures revealed with the push of a button rival those dreamed of by the Forty Thieves. But there's no magic in this modern mechanism—just solid engineering. Here's how it was done.

THE LOWER LEVEL DOORS in Cobo Hall, Detroit's huge exposition hall, weigh-in around the 60-ton mark. Engineering the operating mechanism for these huge doors was no mean feat. Eighteen door hoists lift the door in three sections.

The lift for the main section comprises eight of these hoist units mounted in the ceiling. Each cable drum has four holes for mounting cable. Four separate strands, each with a pull of 3750 lb, were required. The drum operates on a live shaft mounted in 4-in. diameter ball bearing pillow blocks. It is driven through a flange-mounted spur gearset enclosed in an oiltight gear guard. This in turn is driven through a worm gear reducer.

A brake, designed to hold the load when the motor is not operating, is mounted on the high-speed shaft of the reducer. There is, of course, an automatic cutoff which will normally cut the motor out when the door is fully open. But as a safety device, a controlled-torque coupling prevents overstress in the cables, should the cutoff fail. Because of this coupling, which is set at 185 percent of maximum torque, a 15 hp B motor is used instead of the D motor usually specified.

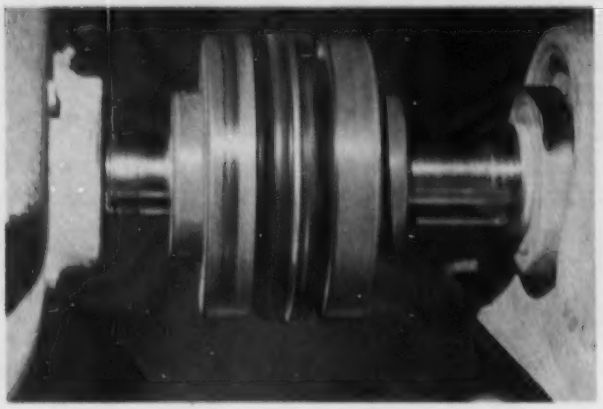
The base of the hoist is an unusual design. The hoist is mounted on the main roof beams, and must allow room for the fluorescent lighting to fit under the cross members. ◆



HIGH TORQUE 1800 RPM MOTOR on the main door drives the winch through a 13.5 rated hp worm reducer and a 25 in. center distance spur gearset. The two side doors are raised by similar transmission sets, but scaled to use 10 hp and 7½ hp high torque motors. Total lifting power is over 200 hp. Door hoists made by Jones Machinery Div., Hewitt-Robins Inc., Chicago.

IDEAS

Flexible coupling saves motor



WRECKED HAMMERMILL was separated from motor at the time of the stress-induced explosion by a properly selected coupling. *Courtesy T. B. Woods' Sons and Co.*

WHEN A HAMMERMILL EXPLODED, the rubber sleeve of its flexible coupling sheared—breaking the connection between the hammermill shaft and the 100-hp drive motor. One flange of the coupling struck a tiled wall 20 ft away. Although the hammermill was ruined beyond repair, the motor was unharmed. Both flanges of the coupling also were unharmed. The flexible coupling saved the expensive motor.

In the plant where the accident occurred, the hammermill (having over 300 hammers) was used to crush wheat. The explosion may have been caused by a tiny pebble slipping through the intake screen.

The coupling consists of two ductile-iron flanges with teeth that lock into mating teeth of a 2-piece rubber sleeve. The sleeve flexes up to 15 deg at peak torque—4510 lb. Mill is direct driven at 3,500 rpm.

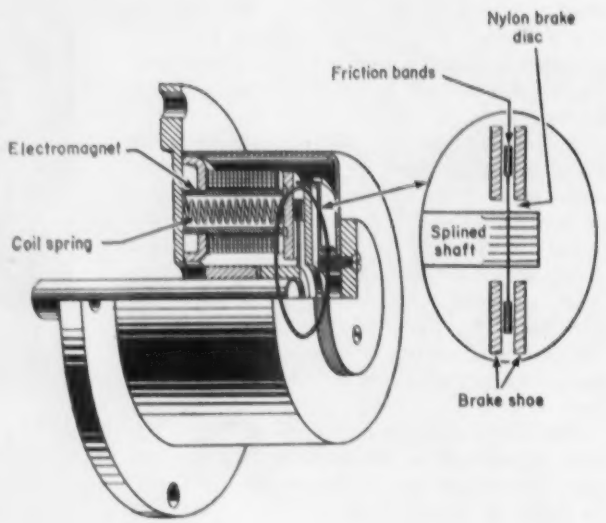
Plastic brake disc reduces noise

SUBSTITUTING NYLON for steel in a brake disc quieted a fractional-horsepower brake. Backlash between splines of the steel shaft and steel brake disc was causing too much noise.

The friction brake disc rotates freely between two brake shoes. During rotation, electromagnets retain the brake shoes until current is shut off. Then coil springs push the shoes against the disc to stop rotation.

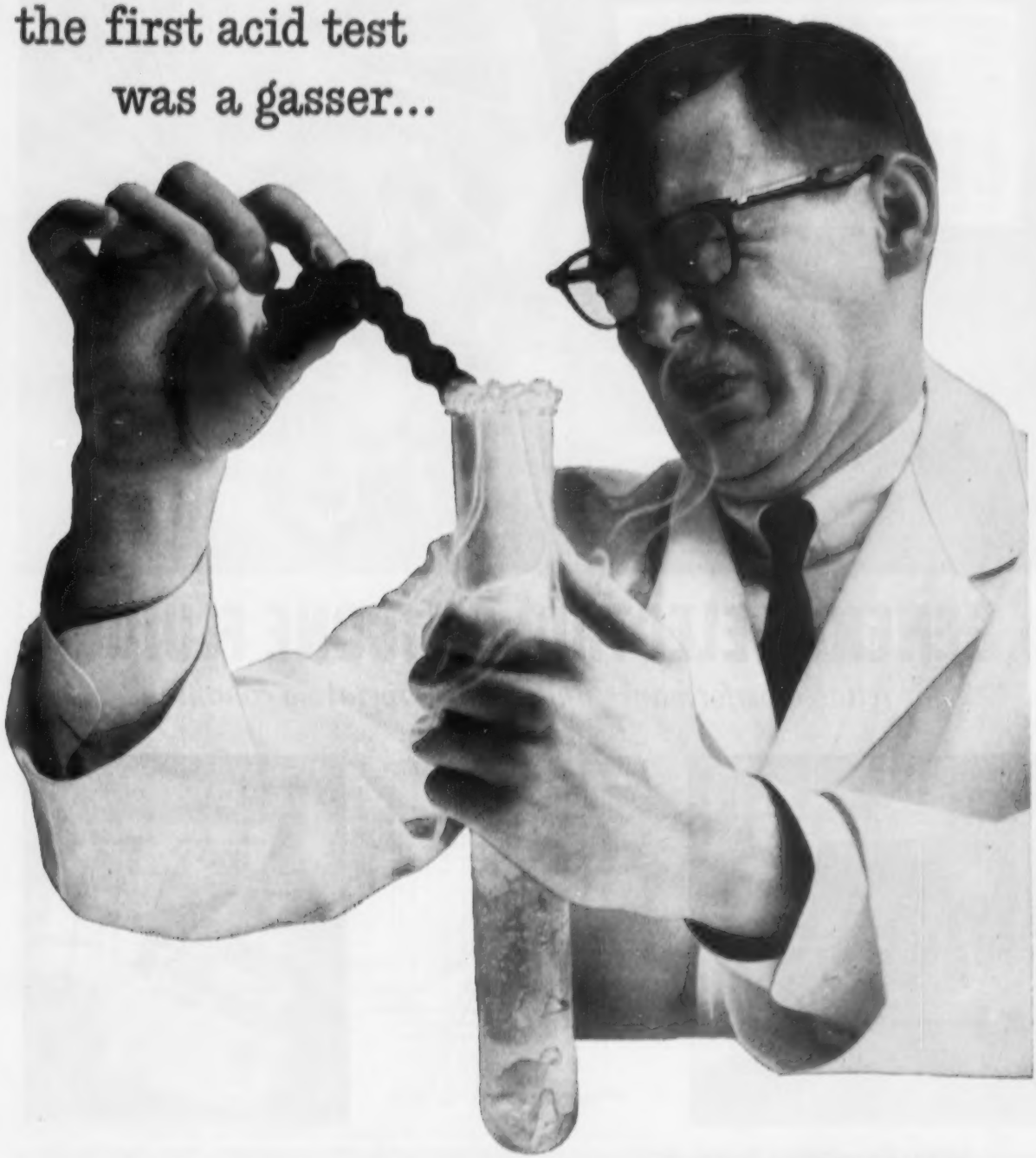
The brake is used on a rotating office file. Nylon fits tightly between the disc and shaft splines. It insures accurate positioning of files. The steel brake discs got noisier with wear because the fit between splined disc and splined shaft became looser.

Nylon discs resist wear, don't loosen during operation. Nylon splines held up for 700,000 test cycles. Also, nylon dampens sound to insure quiet operation.



NYLON DISCS made by Polymer Corp., Reading, Pa. *Courtesy Ridgewood Brake Co., Cleveland.*

the first acid test was a gasser...



The first acid test choked us up and confirmed that acid is tough on any roller chain.

But the final "acid" test—the user test for strength and wear life—told us you can't find a better roller chain than Rex. The reason, of course, is Rex quality materials, modern heat-treat techniques, and precision construction. Ask any user.

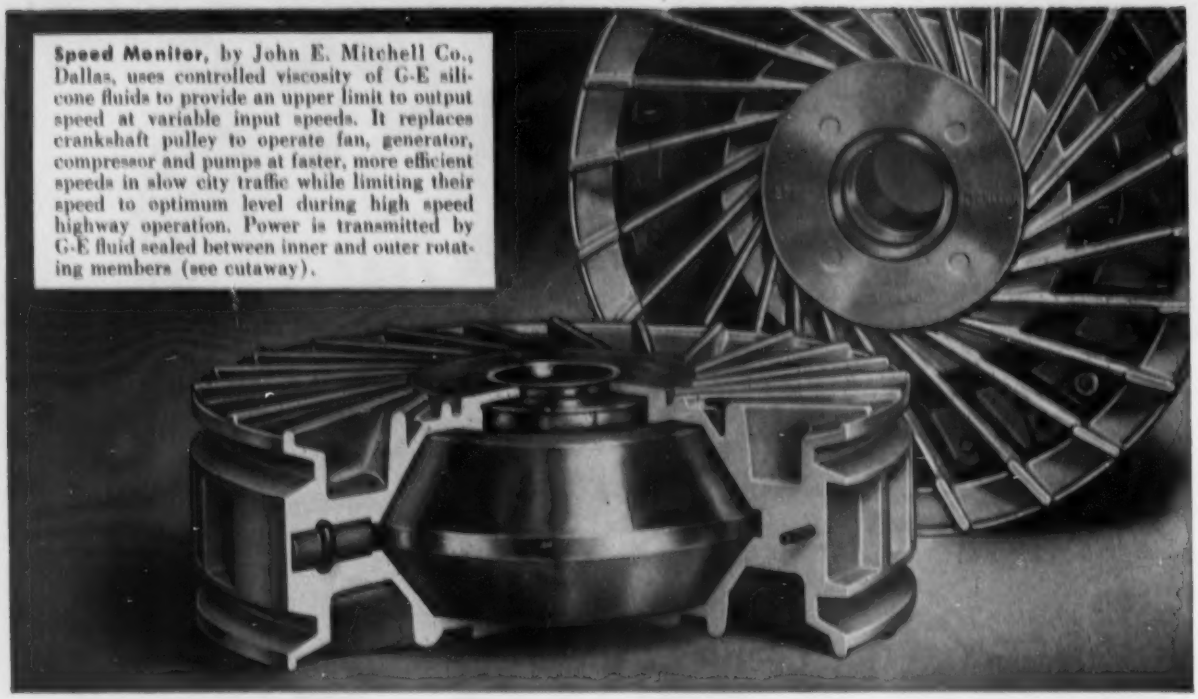
Ask your Rex Distributor or District Sales Engineer for the Rex Quality Story. CHAIN Belt Company, 4734 W. Greenfield Ave., Milwaukee 1, Wis. In Canada: CHAIN Belt (Canada) Ltd., Toronto and Montreal.

REX®

CHAIN BELT COMPANY

REX IS BEST . . . IN THE USER TEST

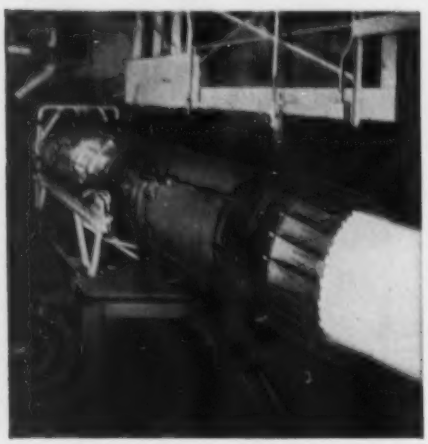
Circle **24** on Reader Service Card



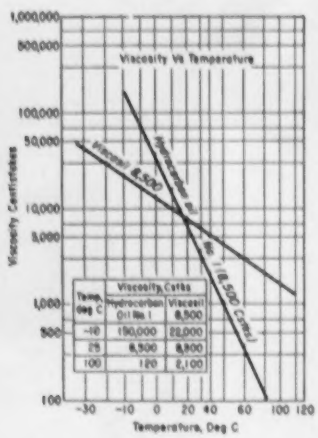
Speed Monitor, by John E. Mitchell Co., Dallas, uses controlled viscosity of G-E silicone fluids to provide an upper limit to output speed at variable input speeds. It replaces crankshaft pulley to operate fan, generator, compressor and pumps at faster, more efficient speeds in slow city traffic while limiting their speed to optimum level during high speed highway operation. Power is transmitted by G-E fluid sealed between inner and outer rotating members (see cutaway).

GENERAL ELECTRIC SILICONE FLUIDS

for reliable performance under tough operating conditions



Thermal stability. The outstanding thermal and oxidative stability of G-E silicone fluids, over an operating temperature range of —100°F to 600°F, makes them suitable for such rigorous applications as jet engine lubricants and aircraft hydraulic fluids. G-E Versilube fluids give unequalled performance at high temperatures and are comparable to other hydraulic fluids in moderate ranges.



Nearly constant viscosity over wide temperature range. G-E silicone fluids exhibit very small changes in viscosity with wide temperature variations. This makes them ideal for many mechanical applications, including fluid drives, dash pots, vibration dampers, timers, shock absorbers, or wherever constant viscosity is needed.

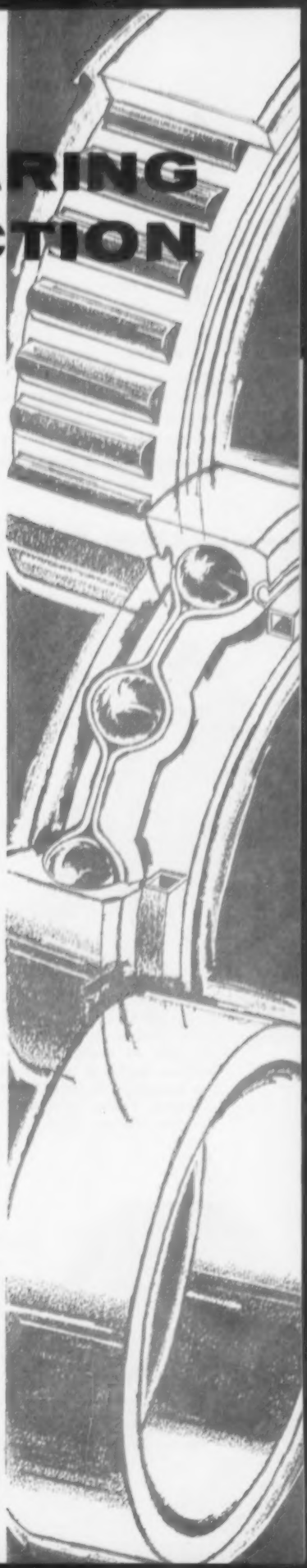
Get the complete story. These bulletins give complete technical data on the G-E silicone fluid line and describe many of the ways in which designers are taking advantage of their outstanding properties. For your free copies, write to Department XX853General Electric Company, Silicone Products Department, Waterford, N. Y.

GENERAL ELECTRIC

Circle **51** on Reader Service Card

BEARING SECTION

HAROLD BELANGER
bearings editor



Bearing Business

IMC Magnetics Corp.—has signed an agreement with **Continental Bearing Research Corp.** for Continental to design air bearings for IMC's standard frame motors. IMC will make the bearings at its Westbury plant. IMC president **Simon Saretsky** says the company is aiming at off-the-shelf deliveries of an air bearing motor.

Minnesota Bearing Co.—Moved its Minneapolis home office and central parts depot to larger premises. The modernization program involved joining together three separate buildings on the site. Total company warehouse and manufacturing space is now 60,000 sq ft.

Link-Belt Co.—appointed **Roy E. Lambert** general manager of their Bearing Plant in Indianapolis. Lambert succeeds **Raymond S. Wood** who is retiring after 47 years with the company.

American Standards Association—issued a revised American Standard on gaging practices. Developed by a 27 member ASA Sectional Committee on a ball and roller bearings, the standard is a referee method to ensure agreement in measurements obtained when inspecting ball and roller bearings. It does not cover tapered or needle roller bearings. *American Standard Gaging Practices for Ball and Roller Bearings*, B3.4-1960. Copies at $1 from ASA, Dept P 242, 10 East 40th St., New York 16, N. Y.

SKF Industries—announce a breakthrough in bearing research that promises great improvements in design of bearing cages and mated bearing components. No further details as yet.

A PTD SPECAL REPORT

User's guide to

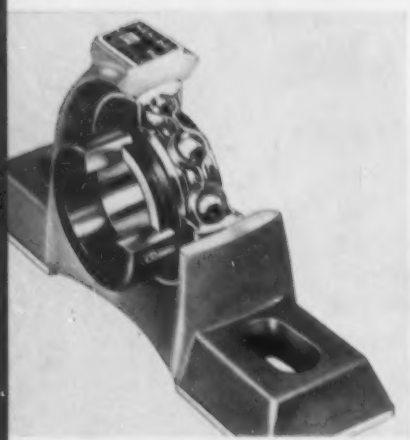
By **HAROLD L. BELANGER**, *Bearings Editor*

WHAT THEY ARE—A mounted unit is an integral assembly consisting of a bearing, a housing, seals, and provisions for fastening the bearing to the shaft. Most mounted units are self-aligning—either through the use of an internally self-aligning bearing, or by a ball and socket joint between the bearing and the housing. This gives some latitude in the initial alignment of housings and permits the bearings to accommodate shaft deflections under load.

Mounted units are versatile assemblies. They are designed for direct mounting on commercial steel shafting; the housings need only a reasonably flat surface to be bolted on to. They have integral seals, and they have an integral lubrication system.

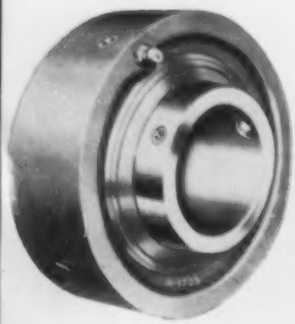
Ball bearing mounted units are for light to moderate loads over a wide range of speeds. Roller bearing units are preferred for moderate speeds with heavy loads and conditions of heavy shock. Ball bearing units are usually less expensive than roller bearing units.

9 TYPES OF MOUNTED UNITS

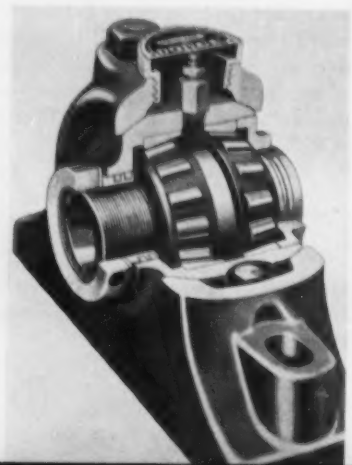


BALL BEARING PILLOW BLOCK. For light to moderate loads and moderate to high speeds. Use where unit is to be mounted on surface parallel to the axis of shaft rotation. Seals are integral with bearing and are not harmed by misalignment of the assembly. Bearing has spherical OD so it is self-aligning. ***Photo courtesy of New Departure Div., General Motors Corp.***

TAKE-UP UNIT AND FRAME. Self-aligning mounted units with simple screw adjustment for changing position of shaft axis. Convenient on belt conveyors where occasional adjustments are necessary to compensate for belt stretch. Ball and roller bearing take-ups are available. ***Photo courtesy of Link-Belt Co.***



CARTRIDGE UNIT. For use when a supporting hole may be bored in the machine frame to accept the machined OD of the unit. It is used for heavy loads; has high rigidity. ***Photo courtesy of Stephenson-Adamson Mfg. Co.***



TAPERED ROLLER BEARING PILLOW BLOCK. For higher loads and heavier service than ball bearings. Note that the double-row tapered roller bearing is not internally self-aligning. It is mounted in a cast iron ring with spherical OD so the assembly is self-aligning. ***Photo courtesy of Dodge Mfg. Corp.***

bearing mounted units

Both can support radial and thrust loads.

The advantages of rolling element bearing mounted units over sleeve bearing units are:

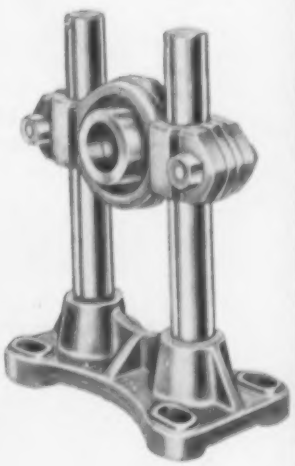
- lower friction
- less frequent lubrication
- less oil or grease leakage
- require less axial space
- greater thrust capacity
- no shaft wear
- do not require high shaft finish

• **Where they're used**—Mounted units are used to support rotating shafts with respect to a machine frame where accurately bored bearing seats in the machine frame are not economical. This is particularly important in fabricated machine frames because line boring bearing seats in the assembly after welding is often difficult. Mounted units can be installed by relatively

CYLINDRICAL ROLLER BEARING PILLOW BLOCK with each component made in halves. Has most features of other roller bearing units and added features of easier installation. Bearings may be replaced without stripping other components from shaft. Has very limited thrust capacity. ***Photo courtesy of Cooper Split Roller Bearing Corp.***

BALL BEARING FLANGE UNIT. Used where mounted unit bolts to a machine frame surface that is perpendicular to axis of rotation. Comes in cast iron and stamped steel housings. ***Photo courtesy of Fafnir Bearing Co.***

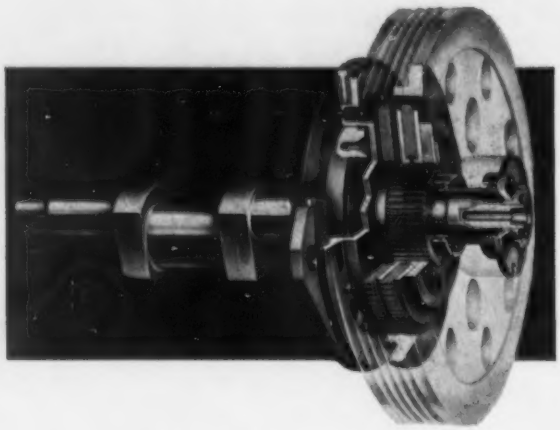
ADJUSTABLE SHAFT SUPPORT. A variation of the pillow block construction with a simple height adjustment feature. ***Photo courtesy of Boston Gear Works.***

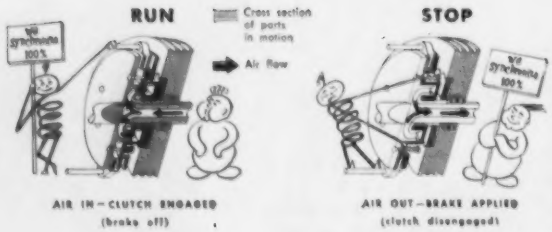


INTERNALLY SELF-ALIGNING ROLLER BEARING PILLOW BLOCK. For high loads, rugged service, and variable misalignment under load. Seals must allow slight misalignment. ***Photo courtesy of Shafer Bearing Div., Chain Belt Co.***

HANGER BEARING UNIT. Housing extension is tapped for a straight pipe thread so it can be supported from a hanger pipe. These units are widely used in screw conveyors, eccentric drives. ***Photo courtesy of Stephenson-Adamson Mfg. Co.***

To Increase Press Efficiency





MINSTER Clutches for Press Conversions

A Minster Clutch conversion is the most profitable way to increase press efficiency because it will

- eliminate downtime caused by clutch failure
- reduce maintenance and parts replacement
- increase die life
- reduce operator fatigue
- improve safety and increase production

Minster conversion units, *made by a press manufacturer who knows your problems*, are standard clutches individually applied to your press. Complete with flywheel and shaft, ready to drop into place. Thousands in daily use.

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MINSTER®

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unskilled labor at the erection site rather than by skilled mechanics in the machine shop.

Since mounted units are integral, self-sealed assemblies, their use eliminates the need to purchase, stock and handle auxiliary components such as locknuts, seals, and lubrication fittings.

Fixed and floating units

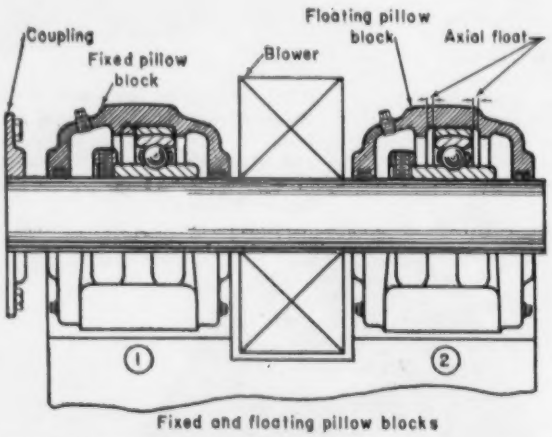
Mounted units constructed so that the bearing is free to float axially with respect to its housing are called "expansion" or "floating" units. This axial freedom at one shaft support compensates for unequal expansion of the shaft with respect to the machine frame. If both bearings were fixed and if the shaft expanded, the resultant thrust might make the bearings fail prematurely.

Shafts supported by more than two bearings should use only one fixed unit. The rest should be expansion units. The fixed mounted unit resists thrust loads from both directions and axially positions the shaft. It should be located at the shaft end nearest the power transmission components.

Shaft clamping

Because mounted units are used directly on commercial shafting, it is not practical to press fit the bearing inner ring on the shaft. The relatively wide tolerance on shafting diameter precludes a consistent press fit—installation would be extremely difficult. Instead, bearing bores are ground to a slight clearance fit with the shaft. The bearing inner ring is clamped to the shaft by external means.

Several arrangements are available for inner ring clamping. Three of the commonest are illustrated.



Fixed and floating pillow blocks

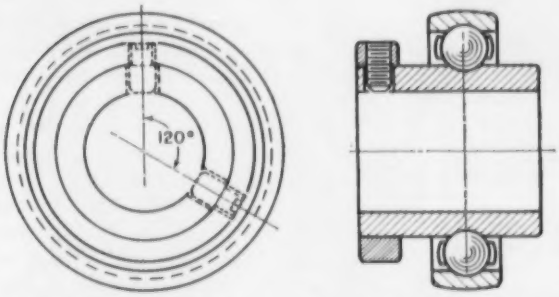
TYPICAL FIXED-FLOATING MOUNTING of two ball-bearing pillow blocks on a hot exhaust gas blower. Initial location of the expansion bearing relative to its housing must permit ample outboard travel. This compensates for blower shaft expansion at operating temperature.

• **Thrust Loads**—Although the bearings used in mounted units can support high thrust loads, the normal shaft clamping arrangements are inadequate

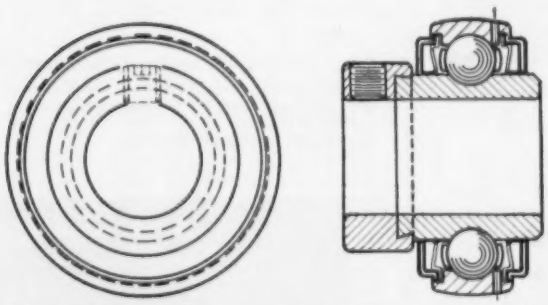
for heavy thrust conditions. When moderate to high axial loads are expected, the bearing inner ring should be shouldered against a retaining ring or shaft shoulder (in the direction of applied thrust). This ensures proper and permanent location of the bearing on the shaft.

• **Precision Units**—At high speeds, the slight eccentricity of eccentric collar or set screw collar mountings can cause high unbalance and severe dynamic loading. For high speeds and for applications requiring high running accuracy, many manufacturers supply precision grade mounted units. These units have a closer bore tolerance than standard units. They must be used with shafting of consistent precision and diameter tolerance to take advantage of this feature.

• **Lubrication**—Many light duty ball bearing mounted units come lubricated with grease and have no provisions for relubrication. They are adequate for many applications. Also, zealous grease gun operators cannot over-lubricate them.



SET SCREW COLLAR has two holes tapped at 120 deg. to each other. The bearing inner ring has two larger holes drilled in the same circumferential position. Dog point set screws in the collar pass through the clearance holes in the bearing inner ring, and are forced against the shaft. The shaft is forced to a slightly eccentric position with respect to the bearing bore. It locks in this relative position. Some mounted units have no collar; the inner ring is tapped to receive the set screws.



ECCENTRIC COLLAR arrangement employs a steel collar with a counterbored recess in one side. This recess is eccentric with the collar bore. The bearing inner ring has a mating notch which is eccentric with inner ring bore. When the bearing is in its proper position, the collar is engaged with the mating cam surface of the inner ring. Then, the collar is turned in the direction that the shaft will rotate in service. The cam action of the two eccentric surfaces locks the assembly firmly on the shaft. This arrangement is self-locking for one direction of shaft rotation. A set screw in the collar safeguards against loosening due to vibration or reverse rotation.

ADAPTER SLEEVE arrangement is used principally with roller bearing mounted units. They are more heavily loaded in service than ball bearing types. They require a more positive and more concentric clamping method. The adapter sleeve has a tapered OD, and is threaded at the small diameter of the taper. It is cut axially at one point on its periphery to accommodate variations in shaft size. The bore of the bearing is tapered to mate with the adapter sleeve. Tightening the locknut reduces the bore of the tapered sleeve. This clamps the sleeve to the shaft. At the same time, the inner ring of the bearing expands and takes up some of the internal clearance in the bearing. Measure bearing clearance with feeler gages after clamping for proper running clearance under the conditions of operation.

High speeds, heavy loads, heat, etc. may require that units be replenished with grease. Where lubrication fittings for this purpose are provided, the manufacturer also provides relubrication instructions. Instructions specify the grease and intervals to grease. These instructions should be carefully followed.

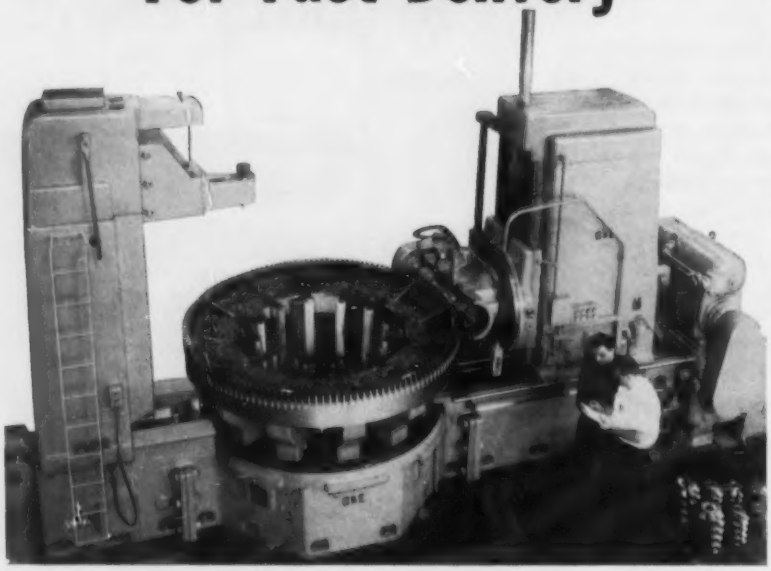
Ball bearing mounted units should be relubricated while they are operating. Only one or two shots from a pressure gun are required; more may damage the seals. Most heavy duty roller bearing mounted units have grease level plugs. Remove them during relubrication. Run the unit for 20 minutes after relubrication with plugs removed. This allows any excess lubricant to run out.

Oil lubrication is desirable for conditions of high ambient temperature, high speed, and where a central oil-lubrication system is available. Most standard ball bearing mounted units may *not* be adapted to oil lubrication but special units are available for this type service. Most roller bearing units may be used with oil lubrication. However, it is desirable to ask the unit manufacturer or authorized bearing distributor for recommendations on proper oil level and type of oil.

• **Standardization and Availability**—Although the internal construction of comparable mounted units of different manufacturers may differ considerably, interchangeability of these units is assured by standardization of certain basic mounting dimensions. These are chiefly the size and location of the mounting bolt holes with respect to the shaft axis. Standardization permits bearing distributors and mill supply houses to maintain comprehensive stocks of all popular shaft sizes of mounted units with minimum inventory cost.

The bearings of most mounted units are replaceable. These bearings are stocked by bearing distributors throughout the world to assure immediate availability if failures occur in service. ◆

New Production Capacity For Fast Delivery



Large Generated Gears

SPUR • HERRINGBONE • HELICAL

for a wide range of industrial applications

Gears which must operate smoothly and without vibration at higher speeds and under greater loads must correspondingly be more accurate in tooth profile and spacing.

H & S Generated Gears answer these demands.

Offering the same high-quality standards which characterize the complete H & S Gear line, production capacities for large generated Spur, Helical and Hobbed-Herringbone Gears are now available in the following dimensions:

Up to 80″ outside diameter at 1 DP
Up to 90″ outside diameter at 1¼ DP
Up to 100″ outside diameter at 1½ DP
Up to 125″ outside diameter at 2 DP
Face widths up to 42″, depending on helix angle

Send your specifications, or let our technical staff make recommendations. H & S specializes in fast production of quality industrial Gearing and Speed Reducers to meet your custom requirements.

Write for Catalog FLB-60

The HORSBURGH & SCOTT CO.

5112 Hamilton Avenue • Cleveland 14, Ohio

Circle **58** on Reader Service Card

Analyzer

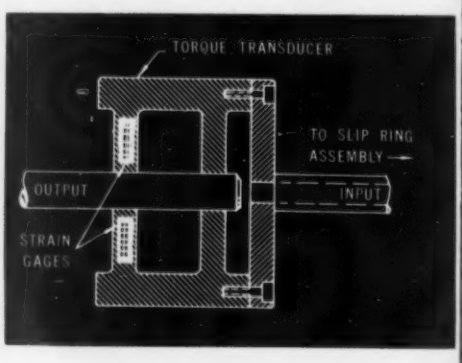
A BEARING ANALYZER that will improve performance and establish higher standards for sleeve bearings, measures only bearing torque. It electronically eliminates the effects of the test equipment torque.

Developed for Tann Bearing Div., Tann Corp., Detroit, the Tann Electronic Bearing Analyzer (called TEBA II), plots curves of the coefficient of friction versus the parameter zN/p (standard curve used in ASTME tests). Company engineers are already using the analyzer in developing a new packaged sleeve bearing and numerous specialty bearings.

By varying loads and speeds, a test bearing's best operating conditions can be pinned down very accurately. Effects of design changes can be readily observed with the analyzer. It shows the effects of changes in material, surface finish, lubricant, and ratios of bearing length to diameter.

TEBA II measures and records bearing temperatures, and the amount of torque to turn the bearings. Results are recorded in the form of a graph. The device can test 1 or 2 bearings at a time at from 0 to 3500 rpm, and under loads of from 0 to 200 lb.

Additional components planned for the analyzer will record bearing noise and vibration, and measure the effects of shaft misalignment. ◆

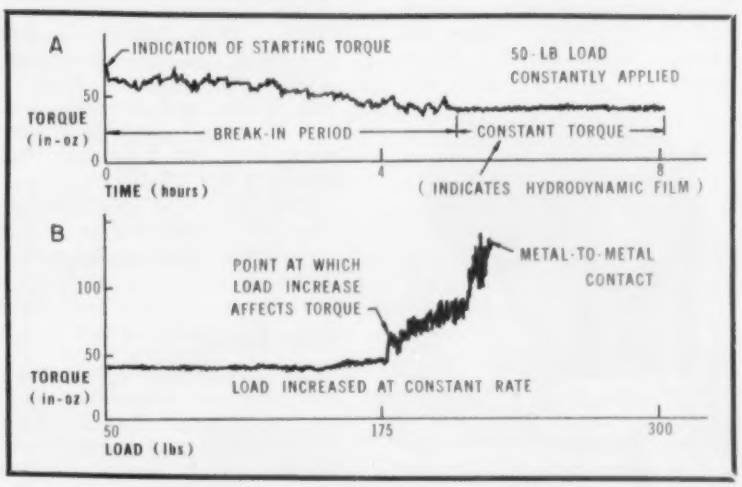


translates bearing chatter into Engineer's language

GRAPH A was made by a new bearing, just placed in the analyzer. For 5 hr, the torque developed by the bearing is high and irregular. As the minute surface imperfections wear away, the marginal lubrication gives way to hydrodynamic lubrication. The bearing members are then completely separated by a film of lubricant, and the torque of the bearing is considerably reduced.

GRAPH B shows the effect of a continuously increasing bearing load. Bearing torque remains constant until a load of (in this case) 175 lb is reached. At this point, the hydrodynamic film is ruptured, and metal to metal contact is established. This shows up as a markedly increased bearing torque, which will rapidly destroy the bearing.

UNUSUAL ARRANGEMENT of strain gages assures that only the torque of the bearings themselves are measured. Two gages are mounted 90 deg apart in a Wheatstone bridge network.

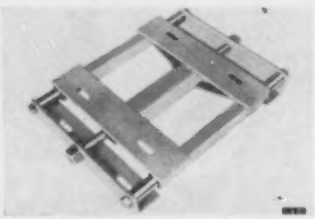


PRODUCT NEWS

To get complete information on these products, use the Reader Service Cards bound into this issue.

Motor bases

Automatic Series 100 motor base comes in standard and vertical types for 19 NEMA frame sizes, from 56 through 326 U. A self-contained spring controls belt tension and compensates for belt stretch.



The 200 Series, for the same frame sizes, is for use with spring loaded variable pitch pulleys. Also available is a linear ball bearings series (BB) in standard and vertical models: BB-10 covers NEMA frames 364 through 505; BB-400 is for rerated frame sizes 364U through 445U.

Manheim Mfg. & Belting Co., Manheim, Pa.

Circle **200** on Reader Service Card

Reversible fhp gearmotors

Heavy duty gear head uses copper brazed carbo-nitrided gears and pinions. Wide range of output speeds from .3 rpm to 500 rpm.

Output hp up to 250 in. lb at 10 rpm. Available in 1/15 hp 220 volt 3 phase, and 1/15 hp 115 volt single phase. Felt oil reservoir lubricating system allows units to be mounted in any position. Base and panel mounting is standard.

New England Gear Works, Inc., Southington, Conn.

Circle **201** on Reader Service Card

Nylon sleeve flexible coupling

Called the Mite, this flexible gear coupling complements the size range of the standard Nyflex series. Total weight is 14 oz., which includes the 2⅝ in. OD sleeve, two zinc die cast hubs, and two Spirolox retaining rings. Overall

length is 2⅝ in. Works at speeds up to 5000 rpm, and will take up to ± 3° misalignment. Runs in both vertical and standard position. The Mite is available in ⅝ in. rough bore, and 8 finished bore sizes from .500 to 1.125 in.

Sier-Bath Gear & Pump Co., Inc., North Bergen, N. J.

Circle **202** on Reader Service Card

Flat Belts

Called Papermaker belts (Type CV), this new transmission belting has increased flexibility from use of a nylon type polymer core. To this core is bonded chrome-tanned leather for a good friction surface. The result is said to be a heavier, increased-capacity belting, which can be used on smaller-than-usual pulleys. Designed for use in pulp and paper mills.

Extremultus, Englewood, N. J.

Circle **203** on Reader Service Card

Reversible drives

A reverse control is available on 33 of the 35 basic fhp models in the 400 Series. On the smaller drives the direction of drive of overrunning clutches in the output section is reversed. On larger drives

reverse is by a bell crank and gear arrangement in a gearhead. Reversing input does not reverse output. Direction may be changed with or without drive running. Neutral position disengages output shaft. Speed from 80-0-80 rpm to 1200-0-1200 with 1800 rpm input. Torque ratings from 3 in-lb through 450 in-lb.

The Zero-Max Co., Minneapolis, Minn.

Circle **204** on Reader Service Card

New motor mounting

Solid base, four-boss end mountings have been added to the 3⅜ in. diam. small induction motor. These 10-frame motors are available in 2-pole designs through ½ hp, and through ¼ hp in 4-pole single phase designs, in both horizontal and all angle, open motors.

General Electric Co., Schenectady, N. Y.

Circle **205** on Reader Service Card

Notched V-belt

CX V-belt has its high-tensile cord micro-positioned and formed onto

Engineering Data

WINSMITH SPEED REDUCERS

HOLLOW SHAFT WORM GEAR SPEED REDUCERS

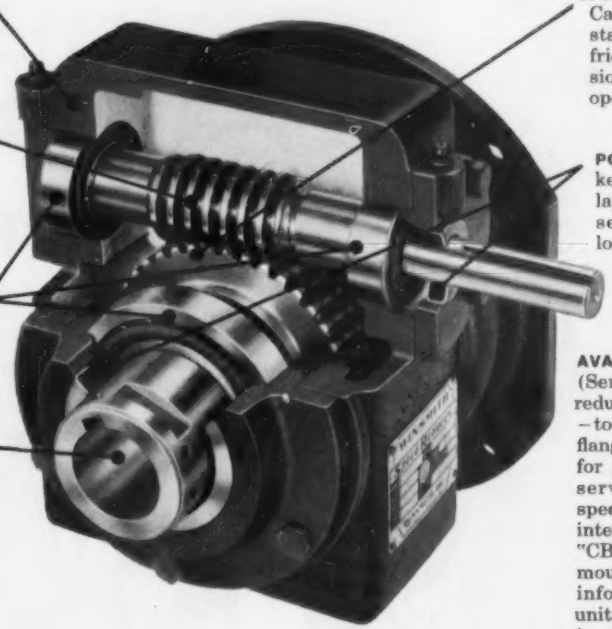
single and double reduction . . . torque arm and flange mounted models

CAST IRON HOUSINGS designed for high heat radiation. One-piece construction, close-grained gray iron for maximum strength and rigidity.

CASE-HARDENED STEEL WORMS cut integral with the shaft. Heat treated for close-grained tough core, carburized and hardened before grinding. Meet AGMA long-wear specifications.

TAPERED ROLLER BEARINGS for minimum maintenance, long bearing life and permanent shaft alignment. High radial and thrust load capacity.

HOLLOW SLOW SPEED SHAFTS in wide range of standard bore sizes and keyways. Mounts on shaft of driven machine *without bushings*—two external slots facilitate removal with standard wheel puller.



SPECIAL BRONZE WORM GEARS Cast to recommended AGMA standards. Low coefficients of friction and thermal expansion for cooler, more efficient operation.

POSITIVE OIL SEALS keep oil in, dirt out. Shafts lapped to micro-finish under seals for uniform contact, longer seal life.

AVAILABLE in single reduction (Series ST and SF) and double reduction (Series STD and SFD)—torque arm ("T" models) and flange mounted ("F" models)—for intermittent or continuous service. Hollow shaft slow speed assembly of "ST" series interchangeable with Winsmith "CB" and "CT" Series with foot mounted housings. For further information on these latter units, write Winsmith Engineering Department.

- *12 Models*
- *.041 to 8.82 H.P.*
- *Ratios 7½:1 to 4466:1*
- *Max. Output Torque 816 to 7678 in. lbs.*

Winsmith Hollow Shaft Speed Reducers cover a broad range of power transmission requirements for both single and double reduction drives. *Their worm gearing provides much higher reduction ratios than are possible in comparable size units using other types of gearing.* Winsmith Hollow Shaft models are designed for all applications where it is advantageous to mount the reducer on the shaft of the driven machine. They are compact, easy to install and require less space than conventional units. Their design and construction provide high shock load resistance; maximum thermal capacity without induced cooling; greater overhung capacity; and a high degree of standardization which eliminates excessive special application engineering.

Write today for complete information or call your nearest Winsmith Representative listed in the Yellow Pages. He is a technically trained expert who is always ready to help you with any speed reducer problem. For both standard and special power transmission applications, you'll find it pays to standardize on Winsmith.

WINSMITH, INC.

204 Eaton Street, Springville, (Erie County), New York

MEMBER OF AGMA

• • • Winsmith Speed Reducers are made by American craftsmen to meet American design and production standards.

Circle **118** on Reader Service Card

PRODUCT NEWS

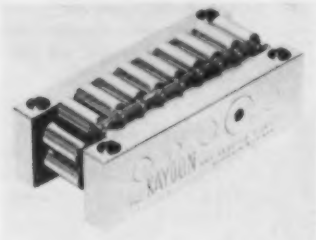
an arch by molding. This gives increased sidewall pressure, better grip and more uniform pitch. Fully molded and jacketed construction to combat flex-cracking and increase fatigue resistance.

Raybestos-Manhattan Inc., Manhattan Rubber Div., Passaic, N. J.

Circle **206** on Reader Service Card

Recirculating roller bearing

Recirc-L-Way has a coefficient of friction of .00025 under 500 lb load and .25 inches per minute linear motion. Ultra-precision

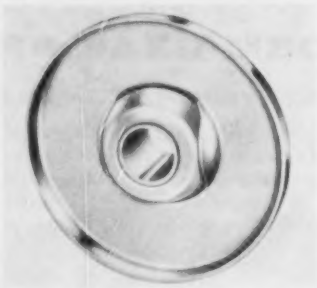


matched sets show a total height variation within ±.000010 in. New feature is a recirculating cage with positive roller guidance between lipped raceways. An approach ramp in the roller path permits rollers to feed freely into the load zone. Net weight is 22 oz. Dimensions—1¼ in. high, 1 11/16 wide and 3¾ in. long.

The Kaydon Engineering Corp., Muskegon, Mich.

Circle **207** on Reader Service Card

Belt conveyor bearing



The criss-cross mounting used places the bearing in the end of the conveyor tube. This gives the advantages of a one-piece mounting for the self-aligning ball unit at a very low cost. Shaft sizes from ¼ in. to 1⅛ in. Depending on loads and speeds, oil, grease or permanent-lubricated bearings can be used.

Triangle Mfg. Co., Oshkosh, Wis.

Circle **208** on Reader Service Card

Aerosol loaded lubricant

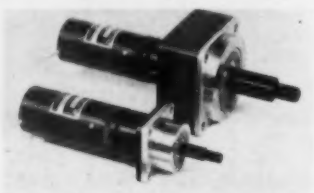
Poxylube 420 has a temperature range of −100 F to 500 F with a viscosity of approx. 100 centipoises and a solids content of 12% non-volatile. The aerosol can will cover 3000 sq. in. with a molybdenum disulphide pigment which dries to form a solid film after 3 to 6 hours. Only surface preparation needed is de-greasing.

Poxylube Inc., Indianapolis, Ind.

Circle **209** on Reader Service Card

Two 1½-in. gear motors

New planetary gearing system on these precision motors provides up to 500 in-lb torque at 8 rpm continuous duty, and up to 1000 in-lb for intermittent use. Ball bearings throughout give stage efficiencies of 95% or better, with a gear-



box rating of 1/10 hp. Choice of 18 reduction ratios from 1.87:1 to 941:1 in the smaller design. With

NOW...
ONE SOURCE
FOR IMMEDIATE DELIVERY ON ALL YOUR
Vari-Speed Belt NEEDS
..from
LOVEJOY

Wide range of sizes from ⅜" to 3" top width
Nominal overall lengths from 26.4" to 170"

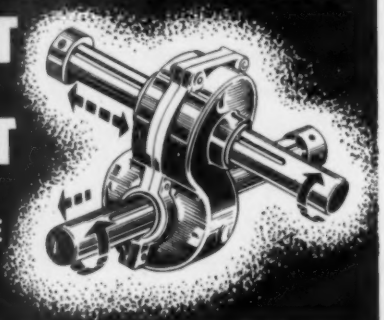
- Fabricated from fiber-reinforced synthetic rubber
- Impervious to oil and heat
- Remain "live" under static conditions
- Stretch resistant properties of reinforcing cords assure length stability
- Constructed to withstand intense squeezing action of pulley sheave walls

Get your copy of industry's most handy guide to the right variable speed belt for every application. *Ask for Catalog No. 61-C.*

Lovejoy
First Name in Power Transmission Equipment
LOVEJOY FLEXIBLE COUPLING CO.
4852 West Lake St. • Chicago 44, Illinois

Circle **68** on Reader Service Card

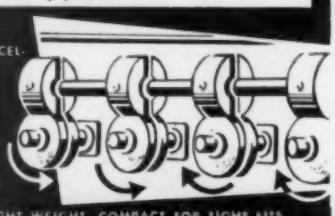
THE MOST FLEXIBLE RIGHT ANGLE GEAR DRIVE DESIGNED
FLOAT -a- SHAFT
UNIVERSAL RIGHT ANGLE GEAR DRIVE COUPLING



New, versatile gear drive designed to meet the needs of many applications requiring power transmission at right angles with a 1:1 ratio.
Easy to install, the floating feature of the unit permits self-alignment on the driving and driven shafts.
Ideal for operating packaging equipment, farm machinery, conveyors, rollers and all types of industrial equipment.

FEATURES

- FLOATS ON SHAFT FOR EXCELLENT ADAPTABILITY TO DIFFERENT MACHINES
- EASY TO INSTALL NO COUPLINGS NEEDED
- SELF-ALIGNING
- HIGH HORSEPOWER AND TORQUE CAPACITY
- HARDENED HELICAL GEARS FOR RUGGED OPERATION
- ALUMINUM HOUSINGS. LIGHT WEIGHT. COMPACT FOR TIGHT FITS



Tol-O-Matic, Inc.
246 Tenth Avenue South • Minneapolis 15, Minn

Circle **104** on Reader Service Card

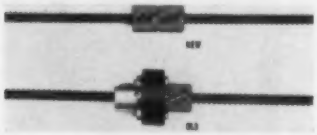
the 3 in. mounting flange, user has a choice of 10 ratios from 219:1 to 5211:1. Output shaft has 18 tooth serrations.

Globe Industries, Inc., Dayton, Ohio.

Circle **210** on Reader Service Card

Small diameter ball nut

Spring pin preloading of ball bearing screw assembly (top) requires



less space and costs less than the flanged method of eliminating backlash (bottom). In the new design, two torque springs backed by pins stop rotation between the ball nuts. Preload is determined by the capacity of the springs.

Saginaw Steering Gear Div., General Motors Corp., Saginaw, Mich.

Circle **211** on Reader Service Card

Fan cooled motors

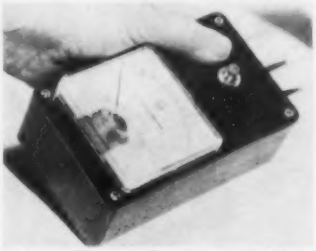
Totally enclosed fan cooled motors come in ratings from ½ to 1 hp in NEMA 56 frames. NEMA standards in capacitor-start and polyphase single speed, and split-phase single and two-speed designs. Rated 55 C rise continuous duty. All angle sleeve or ball bearings are optional on many models.

General Electric Co., Schenectady, N. Y.

Circle **212** on Reader Service Card

Self contained tachometer

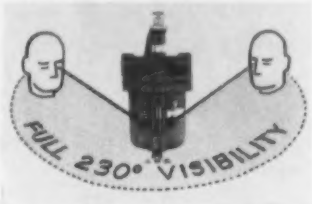
Called the Pioneer Photo Tachometer, it's built around a light-sensitive photoelectric cell. This detects minute illumination changes, transmits a signal to a pulse triggered computer that determines the rpm and shows the result on a direct-reading meter dial. Calibrates all speeds from 0-12,000 rpm. The rotating object is marked with chalk or tape for illumination contrast. Powered by mercury batteries. The light beam powered by pen light cells.



The Pioneer Electric & Research Corp., Forest Park, Ill.

Circle **213** on Reader Service Card

Lubricant reservoir



An all-metal reservoir of die cast zinc alloy is equipped with a sight level indicator made of pyrex tubing. The tube is protected by a thin metal strip running full length in front. Level of contents is visible for a full 230 degrees. Called the Saf-T-Bowl, it answers to the new safety restrictions placed on use of plastic bowls.

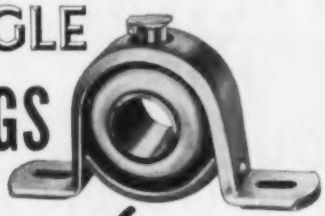
Wilkerson Corp., Englewood, Colo.

Circle **214** on Reader Service Card

Motor generator set

New 5 KW motor generator is designed for a power source in

TRIANGLE BEARINGS with Engineered INDIVIDUALITY



Triangle fits the bearing to the application. Whether you can use a standard, like the Pillow Block above, or need a special such as the Pedestal or Clamshell Bearings shown below, your particular bearing problem receives the individual attention best assuring cost reductions — quality improvements.

SELF-ALIGNING . . . SELF-LUBRICATING SLEEVE-TYPE PILLOW BLOCKS

The widest selection of mountings available — functionally designed, efficiently produced. Experienced sales engineers available to help you anywhere. Phone or write for descriptive literature.

TRIANGLE MANUFACTURING CO.
734 Division St. Oshkosh, Wisconsin

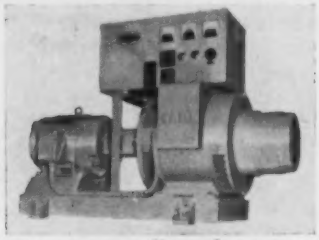
Circle **106** on Reader Service Card

looking for STRONG and economical CHAIN?

Circle **67** on Reader Service Card

PRODUCT NEWS

laboratory testing. The set has static regulator in a top-mounted panel box. The panel box is equipped with volt meter, ammeter, selector switch, frequency



meter, an ac adjust rheostat and one across the line induction motor starter. The exciter is brushless design with completely shielded bearings. Input is rated at 60 cycles, 1200 rpm, 220/440 volts with a 10 hp motor. Voltage can be regulated within 1% from no load to full load. Maximum harmonics: 3% line to line; 5% line to neutral.

Kato Engineering Co., Mankato, Minn.

Circle **215** on Reader Service Card

Trailer axles

Three new series, known as the TH, TR and TU, added to the TK Series, provide a capacity range from 14,000 lb to 30,000 lb. The TH Series of 14,000 lb capacity takes both single and dual wheel applications. The TR. is for loads up to 22,500 lb and the TU, largest of the series, handles up to 30,000 lb. All three types have all the tested features of the TK Series.

Rockwell-Standard Corp., Transmission & Axle Div., Detroit, Mich.

Circle **216** on Reader Service Card

Pillow blocks

New Series P2-300 heavy duty ball bearing pillow blocks are equipped with AFBMA-standard, self-aligning, single row, deep groove, precision ball bearings. Thirty one

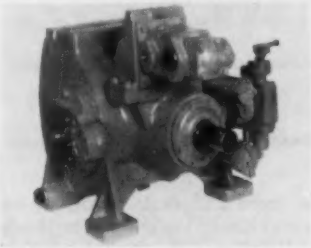
shaft diameters, from ⅝ to 4 in. Dimensional interchangeability with other makes.

Link-Belt Co., Chicago, Ill.

Circle **217** on Reader Service Card

Piston pumps and motors

Series 120 units are available either as pumps or motors with fixed or variable displacement.

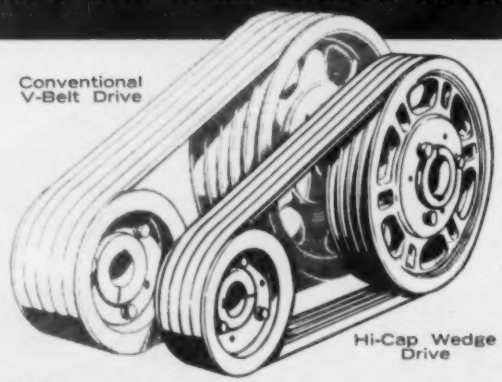


With atmospheric intake, they operate at 1200 rpm, with supercharging at 1800 rpm, permitting the use of standard electric drive motors. Pump delivery at these speeds is 120 and 180 gpm. Maximum pressure rating is 5000 psi. Maximum displacement is 23.7 cu in. per rev. and max. torque is 378 in. lb per 100 psi. A wide variety of optional controls.

Vickers Inc., Detroit, Mich.

Circle **218** on Reader Service Card

Save with HI-CAP WEDGE Drives



Gain these savings, for example, on a 44 HP drive:

- 18% less drive cost
- 17% less weight
- 43% less face width

than conventional V-belt drive. Similar savings possible on many other drive requirements. Write for Catalog 125.

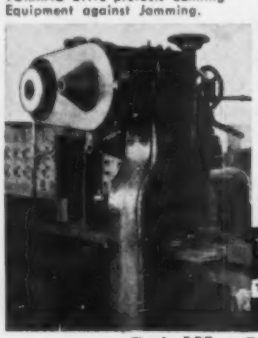
FORT WORTH
STEEL AND MACHINERY COMPANY
Dept. PTD, Fort Worth 1, Texas

Circle **45** on Reader Service Card

PREVENT MOTOR BURNOUT

Install Positive
"MOTOR PROTECTION"
with GLEASON-TORMAG® Magnetic DRIVES

TORMAG Drive protects Canning Equipment against Jamming.



Motor overload, high inertia starts, varying loads, jamming, stalling — just can't damage your motor, machines, products, or production schedule when you add GLEASON-TORMAG Magnetic Drives. TORMAG Drives cushion your load, provide dependable controlled torque, high slip or continuous stall operation that no other device can equal — and without maintenance! **Write on your company letterhead for suggestions, and your copy of catalog TP2-60.**

TORMAG PRODUCTS
Div. GLEASON REEL CORP.
Representatives in Principal Cities in U.S. and Canada

Circle **105** on Reader Service Card

Journal bushings

Self-lubricating journal bushings can take dynamic loads up to 25,000 psi and static yield loads to 50,000 psi at low rotational speed

without damage. Housings are stainless steel with Dyflon plastic alloy inserts. Bore sizes from ¼ to 3 in.

Southwest Products Co., Monrovia, Calif.

Circle **219** on Reader Service Card

Extreme temperature lubricant

Molykote X-15 is an inorganic-bonded dry film lubricant with a useful temperature range of from −300 F to 1200 F. In addition, it's insensitive to liquid oxygen, is unaffected by gamma radiation and retains its lubricating quality in high vacuum. Applied by brushing or spraying to a clean surface, it air-dries in one hour. Starting torque at −100 F is 12.5 in. lb compared to 126 in. lb for ordinary −100 F. grease.

Alpha-Molykote Corp., Stamford, Conn.

Circle **220** on Reader Service Card

Flexible coupling with new synthetic member

A non-metallic material called Lovellex is used for the flexing member of a new line of couplings for shaft diameters from ½ to 3½ in. Capacity hp per 100 rpm ranges from 0.3 to 29 Flexural fatigue strength of the new material is said to exceed steel. Other advantages are light weight and zero backlash. Special sizes and ratings available.

Lovell Mfg. Co., Erie, Pa.

Circle **221** on Reader Service Card

Strap type pillow block

Series 1330-1338 now comes in shaft sizes ⅛ in. through 1 in. This increases the range of sizes for this type from ⅛ in. through 2 3/16 in. Sintered bronze or graphited bushing. Oil or grease lubrication, or permanently lubricated with Plastic E. A simple detent arrangement holds the 16-gage, cadmium-plated cap and base together until the mounting bolts are in.

Randall Graphite Bearings, Inc., Lima, Ohio.

Circle **222** on Reader Service Card

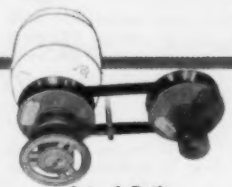
Shaft collar

Torque collar combines a threaded mounting flange and an independent acting spring locking shaft collar into a one piece unit. Locking action is equivalent to a shrink fit. Torque is transmitted without keyways. Overload slip, if set

GERBING 25 HP Variable Speed Drives

SAVE 50% compared to enclosed motor drives!

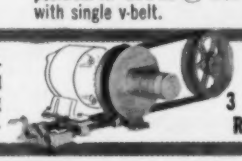
- Infinitely Variable Speed Change Ratios—Up to 8-1.
- Low Initial Cost—uses standard motor or engine.
- Maximum Efficiency. V to V.
- Compact—Easy to Install.



8 to 1 Ratio

TYPE W ROTO-CONE—FIXED CENTER DRIVE . . . mechanically operated. Turning the handwheel changes the pitch dia. of both pulleys. May be mounted in any position. HP thru 25 @ 1750 rpm with single v-belt.

No. 1325 ROTO-CONE with Adjustable Motor Base Control. Speed changes made without stopping motor. HP thru 25 @ 1750 rpm.



3 to 1 Ratio

Other size ROTO-CONE Variable Speed Pulleys are available . . . from fractional thru 25 HP. Gerbing Speed Control Engineers are at your service. Write for Catalog 660.

GERBING MANUFACTURING CORP.
ELGIN, ILLINOIS Tel: SHerwood 1-2790

Circle **52** on Reader Service Card

MOLYKOTE® M-88
BONDED LUBRICANT COATING

FREE SAMPLE!

Handy Applicator Bottle • Enough Lubricant to coat parts for evaluation • Absolutely FREE! • New industrial lubricating technique • Simply apply like a paint • Allow to air dry • Provides 100% safety against galling and seizing • Smooth, protective lubricating film bonds to most surfaces • Lifetime lubrication in many applications • Mail the coupon today.

THE ALPHA-MOLYKOTE CORP.
65 HARVARD AVENUE • STAMFORD, CONN.

The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.
Please send me a FREE SAMPLE of MOLYKOTE M-88. PfD-8

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Circle **5** on Reader Service Card

PRODUCT NEWS

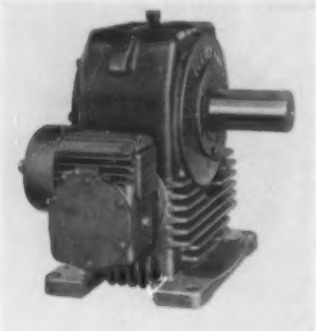
torque is exceeded. Sizes from ¾ to 2 in. bores.

Kolock Products Co., Lutherville, Md.

Circle **223** on Reader Service Card

Double reducer

This reducer attains up to 3600:1 reductions by mounting a worm and gear at a 90° angle to another. Primary and secondary housings are parallel to one another. High speed housing is cooled to AGMA standards by aluminum or plastic fan. Both reductions share a common oil bath. Ratio selection between 25:1 and 3600:1 (approximately), in 7 sizes with torque capacities between 22,700 in. lb. and 145,000 in. lb. Centrifugally cast bronze gears keyed or bolted to cast iron hubs. Steel shafts, hardened convolute worms.



Cleveland Worm & Gear Div., Eaton Mfg. Co., Cleveland, Ohio.

Circle **224** on Reader Service Card

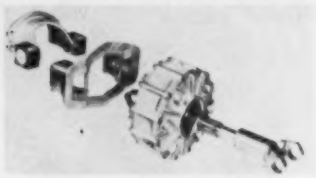
Spiral wound gasket

Guardian gasket works effectively at temperatures from 1250 F to 1900 F. It uses a ceramic paper filler which is non-flammable, completely inorganic, and a good chemical insulator. Thickness: up to .060 in.

Garlock Inc., Palmyra, N. Y.

Circle **225** on Reader Service Card

Shaft mounted retarder



Package assembly combines retarder, propellor shaft and a new-design mounting bracket. The 2-piece, hinged mounting bracket has rubber-mounted journals to prevent propellor shaft joint angles from moving. In addition to supporting the retarder, the bracket transfers retarder braking reaction torque through transmission and engine case to vehicle frame. Mainly of aluminum, the Spicer-Thompson retarder takes Spicer 1650 and 1700 series propellor shafts—as short as 13¾ in. between transmission and axle joint centers. Maximum braking output is 900 hp at 2400 rpm.

Dana Corp., Toledo, Ohio.

Circle **226** on Reader Service Card

Lubricant filtration kit

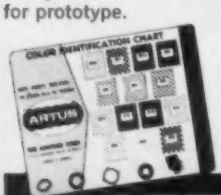
Kit consists of a 10 cc precision-ground glass syringe, with a special adapter and 25 membrane filters. The filters will remove particles down to .25 microns. Fluid volume can be directly measured

NEW THE COLOR TELLS THE THICKNESS

ARTUS 100 SHIMS THIS SIZE

Send blueprint for shape required. Special tooling, first order only $9.75.

Real time savers in production and maintenance. Used by thousands including America's best known companies. More efficient, more convenient. Always available. Ideal for prototype.



FREE — Handy COLOR CHART, also samples and literature. Write today!

THE ARTUS CORPORATION
201 S. Dean St. • Englewood, New Jersey
LOwell 7-0900

Circle **11** on Reader Service Card

REPRINTS

The following reprints of feature articles from POWER TRANSMISSION DESIGN Magazine are available:

ELECTRIC MOTORS

Covers ac and dc types. Tables show who makes what. From Nov., Dec., 1960 and Jan. 1961 issues. Thirty-two pages.

1-9 copies $1 each
10-49 copies 75c each
Over 50 copies, 50c each

CLUTCHES AND BRAKES

An introduction to both friction and positive contact types. From June and July 1960 issues. Sixteen pages.

1-9 copies, 75c each
10-49 copies, 50c each
Over 50 copies, 30c each

GEARMOTORS

Put the power where the work is—with a gearmotor. From Jan. 1960 issue. Twelve pages.

1-25 copies, 25c each
Over 25 copies, 10c each

ELECTRICAL SPEED ADJUSTMENT

Tells how to adjust your speed, any speed, precisely, electrically. Sixteen pages.

1-25 copies, 25c each
Over 25 copies, 15c each

NOMOGRAMS

Six nomograms for complete mounting of pivoted motor, base and accessories.

Copies 15c each

Send all orders—enclosing the exact amount in coins or checks—to: POWER TRANSMISSION DESIGN, 812 Huron Road, Cleveland 15, Ohio.

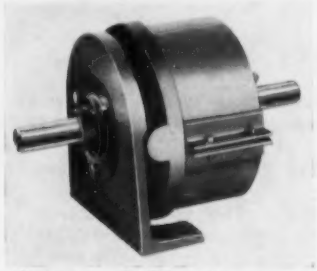
to 1/10 cc. Supplied with one 23 gauge ½ in. needle.

Bearing Inspection, Inc., Huntingdon Park, Calif.

Circle **227** on Reader Service Card

Electric disc brakes

New 55,200 Series offers users a floor mounted, thru shaft brake



with its own ball bearing-mounted shaft. For applications that need a through-the-brake drive, the series is ac operated, with torque ratings of 1½, 3, 6, 9, 10, and 15 ft-lb.

Stearns Electric Corp., Milwaukee, Wis.

Circle **228** on Reader Service Card

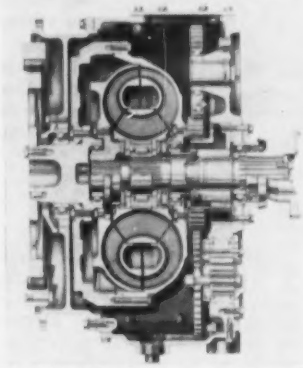
Detent pins

Solid shear Ball-Lok detent pins are now available in a complete range of sizes. Diameter sizes from ¼ in. to 1 in. with grip lengths in 1/10 in. increments. Balls are spring loaded, and opposite placement of balls equalizes pull forces. Shoulder on the head prevents damage to the pull ring. Close tolerances on the shank insure interchangeability of pins. Available in 4130 alloy steel and 303 stainless.

Avdel, Inc., Burbank, Calif.

Circle **229** on Reader Service Card

Torque converters



Handling loads from 100 to 700 hp these converters are designed to provide and infinite number of torque-speed ratios for off-highway vehicles, tractors, industrial drives. Converters are single stage, 3-element type with torque multiplication ratios from 2.3:1 to 3.5:1. Sizes up to 18⅝ in. diameter, with or without automatic over-running reaction members.

Rockford Clutch Div., Borg-Warner Corp., Rockford, Ill.

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Split locking collar

Made from self-lubricating wood, this bearing can be use for any

existing shafting supported by plain journal type bearings. Split for easy installation. Called the Pobco, it also serves as a thrust surface by eliminating metal-to metal contact.

Paramount Oilless Bearing Co., Inc., Worcester, Mass.

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and again... another NEW product from Stearns

4 "Packaged" Clutch-Brakes (Type SMCB)

● Pre-Assembled ● Pre-Aligned ● Ball Bearing Mounted Shafts ● More Economical ● Install Faster—Easier ● Up to 150 Cycles per Minute ● Speeds to 3600 RPM ● Accomodate sheaves, sprockets, or direct coupling.

Size #2.2 SMCB—8 lb-in. Torque; 2¼" Dia.; Weight—4 lb. Size #3 SMCB—60 lb-in. Torque; 3⅛" Dia.; Weight—7½ lb. *Size #5 SMCB—240 lb-in. Torque; 4⅞" Dia.; Weight—16 lb. Size #5.5 SMCB—540 lb-in. Torque; 6¾" Dia.; Weight—33 lb.

Request Bulletin 2-61-C

Stearns ELECTRIC CORPORATION
120 NORTH BROADWAY
MILWAUKEE 2, WISCONSIN

The Complete Line of Electromagnetic Clutches — Brakes — Clutch-Brakes
SINCE 1917 THE SOURCE OF LEADING MOTOR AND MACHINERY MANUFACTURERS

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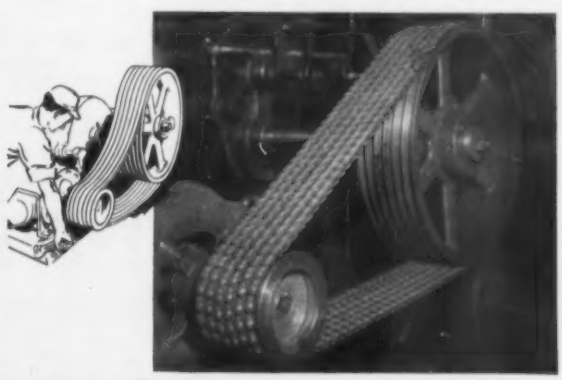

Veelos stays TIGHT

You never have to tilt or reset a motor, or tear down outboard bearings to replace a set of v-belts, when Veelos is installed on a drive.

Veelos stays tight—maintains the right tension to operate your machines at top efficiency. And, if adjustment of an individual belt should become necessary, all you do is add or remove a link or two—a job that takes minutes instead of hours.

With unique Veelos link construction, you get uniform power transmission, no slippage, no wasted power, no uneven belt and sheave wear. Get the full story of how Veelos-equipped drives assure maximum machine operation—*send for a free Veelos Data Book.*

VEELOS THE BALANCED LINK V-BELT

MANHEIM
Manufacturing & Belting Company
Manheim 9, Penna.

There's no substitute for quality! Insist on genuine Veelos—made only by Manheim.

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FREE REFERENCE MATERIAL from this month's ads

Readers may obtain any of these reference materials by circling the numbers on the reader service cards.

2. CHAINS—Acme Chain Corp. has a 100-page illustrated chain catalog with engineering section and application data.

5. LUBRICANT—Alpha-Molykote Corp. offers free sample of Molykote M-88 anti sieze lubricant.

8. BEARING BRONZE—American Smelting and Refining Co. will give you more information on Asarcon 773 continuous cast bronze.

11. SHIMS—Artus Corp. will send literature, samples and a handy color chart for shims, color-coded by thickness.

13. ROLLER CHAIN—Atlas Chain & Mfg. Co.'s design idea kit is a file folder that includes 19 new ways to use roller chain, in blueprint form.

21. BELT DRIVES—Browning Mfg. Co. cover many types of belts, sheaves and drives in descriptive catalog GC101.

31. STEEL SPROCKETS—Cullman Wheel Co.—Write for information and literature on Grip-Master sprockets.

37. SHAFT MOUNTING—Dodge Mfg. —You can save time and trouble with the Taper-Lock method of mounting wheels on shafts. Bulletin for details.

38. SYNTHETIC BELTING—R. & J. Dick Co.—Send for catalog on oil-resistant Suplex belting, available fractional to 1000 hp.

41. FLEXIBLE SHAFTS—B. W. Elliott Mfg. Co.—Catalog 263 tells you how to save assembly time and labor by replacing many parts with a flexible shaft assembly.

45. WEDGE DRIVES—Fort Worth Steel & Machinery Co. tells you how to save space and money by replacing conventional belt drives with the Hi-Cap Wedge system.

50. SMALL GEARING—Gear Specialties—Small Gearing Guide covers bevels, helicals, internals and many other types. Also contains useful charts.

OFFERED FOR THE FIRST TIME . . .

The services and reference materials listed here are being offered by advertisers to readers for the first time

51. SILICONE FLUIDS—General Electric Co.'s bulletins give all the necessary data on their silicone fluid lines and tells how to use their properties.

99. CLUTCH/BRAKES—Stearns Electric Corp—Request Bulletin 2-61-C for details of 4 new packaged clutch/brakes.

119. TIMING BELT DRIVES—T. B. Wood' Sons Co.—Five easily understood charts in Bulletin 21103 give correct drive selection with almost no calculation.

121. FLAT BELTS—Extremultus Inc.—New 12-page illustrated catalog gives complete engineering and application data.

52. VARIABLE SPEED DRIVES—Gerbing Mfg. Corp.—Write for Catalog 660 for details of V to V drives from fractional through 25 hp.

56. SLIP CLUTCHES—Hilliard Corp. —Bulletin 300 for complete details of slip clutches to protect any driven machine, from dishwashers to printing presses.

58. GEARS—Horsburgh & Scott Co.—Write for Catalog FLB-60 for information on large generated gears—spur, herringbone or helical.

68. VARIABLE SPEED BELTS—Lovejoy Flexible Coupling Co. offers a handy guide to the right variable speed belt for every application.

71. BELT DRIVES—Maurey Mfg. Corp. —Catalog B-60 gives details of the Super Wedge V-Drive for getting bigger drive capacity into smaller space.

74. CLUTCHES—Minster Machine Co. —Clutch Conversion Booklet CC57 tells you how to increase press efficiency by converting to air clutches.

69. LINK-V BELT—Manheim Mfg. & Belting Co.—Veelos Data Book describes how this belt maintains the right tension for top efficiency.

87. FLAT BELTS—Rhoads & Sons will send descriptive bulletins on synthetic, leather/nylon, and leather belting for a wide range of transmission and conveyor jobs.

95. CUT GEARS—Simonds Gear & Mfg. Co.—Write for literature and quotations for a full range of sizes, types and materials.

96. ELECTRIC CLUTCHES & BRAKES —Simplatrol Products Corp. give detailed literature on a line of electric clutch/brakes with a new diaphragm action.

105. MAGNETIC DRIVES—Tormag Products Div., Gleason-Reel Corp. have suggestions for stopping motor burn-out by putting in magnetic drives. Catalog TP2-60.

106. BEARING MOUNTINGS—Triangle Mfg. Co.—Descriptive literature on self-lubricating sleeve type pillow blocks, both standard and special types.

108. AC DRIVE SYSTEMS—U.S. Electrical Motors' Varidyne Brochure F-1963 has solutions for many motor speed changing problems.

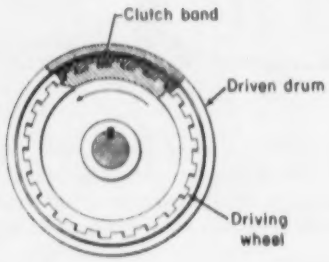
118. SPEED REDUCERS—Winsmith Inc.—You can get complete information on their hollow shaft worm gear speed reducers, both single and double reduction.

PATENTS

Centrifugal clutch

U. S. Patent No. 2,987,158; Elmer C. Kiekhaefer, Cedarburg, Wisc.

A toothed driving wheel, a clutch band, a series of friction blocks, and a driven drum comprise a centrifugal clutch. Driving-wheel teeth mesh with teeth of the molded, elastic, clutch band. This band contains the

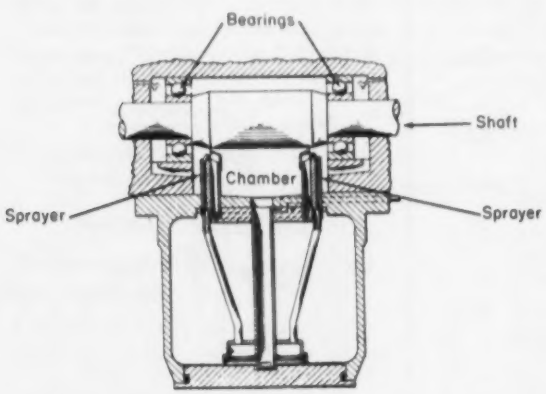


friction blocks—evenly spaced and flush with the periphery. The blocks have greater density than the band. As the driveshaft starts to turn, the clutch band is forced into contact with the drum and brings it up to speed before the band material engages the drum. This reduces abrasive action of the drum and heat of the band.

Mist lubrication system

U. S. Patent No. 2,986,433; Fred Herrman, West Englewood, N. J., assignor to the Bendix Corp., Detroit.

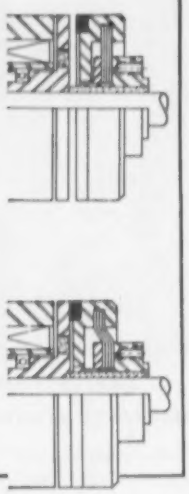
A high-speed lubrication system for high-speed rotating machinery. Two oil-mist sprayers extend into an annular chamber formed between two shaft-mounted



bearings. Air aspirates the oil, which forms a mist at the inner surfaces of the bearings. Excess oil returns to the sump by gravity.

Continued on page 60

CREATIVE
Electromagnetic
Clutch-Brake
Engineering
by Simplatrol



The patented Simplatrol diaphragm action has opened new doors in creative electric clutch-brake design and engineering.

There is no other clutch-brake unit like Simplatrol . . . no other package which delivers the same ultra swift response, the same smooth silent operation, the extra long life. Only Simplatrol has just one moving part . . . the Simplatrol diaphragm . . . to reduce wear to the lowest degree possible.

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Simplatrol Electric Clutches & Brakes In Fixed Field and Rotary Field Styles

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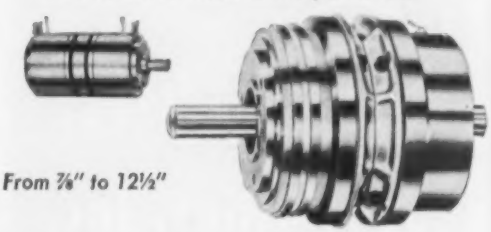

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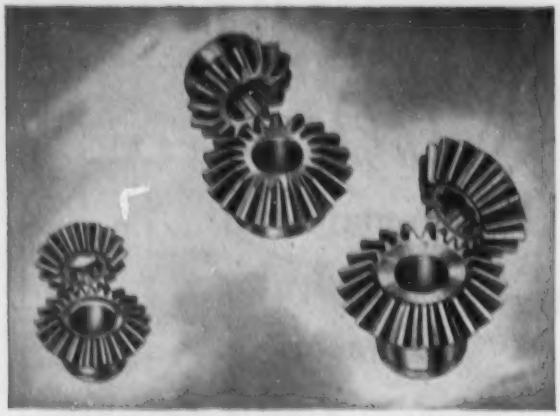

Shortest way to better production, smoother product performance: G. S. Bevels

Nobody argues with the old axiom, "Time is Money"—and it's more and more costly to have assembly operations interrupted or slowed down by ill-fitting or defective parts. G.S. customers (whose roster reads like a Blue Book of American industry) don't worry about such problems. They've learned that they can rely on famous G.S. precision manufacturing methods and rigid inspection systems for Small Gearing made *right*, every time—Gearing which meets demanding specifications, makes assembly smoother, gives efficient performance in product use.

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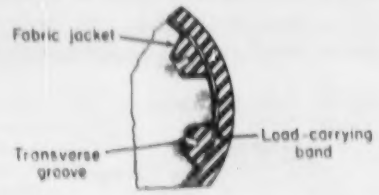
PATENTS

Grooved-tooth belt

U. S. Patent No. 2,988,925; Herman C. Sauer, Ambler, Pa., assignor to United States Rubber Co., New York.

An endless flexible-rubber belt has equally spaced teeth and a tough loading-carrying band. Belt driving surface has a fabric jacket. Improvement over present



toothed belts lies in a small slot in each tooth. When belt meshes with pulley grooves, trapped air between them flows into the transverse grooves. The wall bounding each groove is continuous and curved at its upper part.

Sealing ring

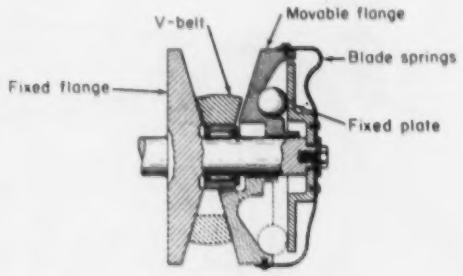
U. S. Patent No. 2,983,533; Richard E. Tisch, Minneapolis, assignor to A-P-D Co., Minneapolis.

A continuously formed ring seal made of a resilient, flowable material. It fits into a ring-shaped sealing groove. Axial cross section is substantially greater than the radial cross section. This eliminates rocking, rolling, and twisting of the seal in applications where opposed surfaces have relative axial motion.

Variable-speed sheave

U. S. Patent No. 2,986,043; Eric Jaulmes, Paris, France, assignor to Ateliers de la Motobecane, Société Anonyme Francaise, Pantin, France.

A variable-speed sheave uses a radial cam and balls to govern belt speed. As the sheave rpm increases, centrifugal force moves the balls outward. The movable



flange slides closer to the fixed flange. This moves the V-belt outward to a larger pitch diameter. Sheave speed decreases until it reaches equilibrium. Blade springs connected between plate and cam oppose motion toward the close position.

LITERATURE

on drives and components

To get free copies of the following literature, use the Reader Service Cards bound into this issue.

Controlled speed system

This revised brochure illustrates 12 typical speed control systems, both electrical and pneumatic. Included are 5 frequency control multi-motor systems as well as single motor systems using drives and torque motors. Also shows the Dial-A-Torq control providing adjustable motor slip on a calibrated basis. *U. S. Electrical Motors Inc., Los Angeles, Calif.*

Circle **300** on Reader Service Card

Roller chain catalog

Illustrated roller chain and sprocket catalog contains 106 pages of power transmission plans and ideas. Engineering section explains 35 methods of chain adjustments on moveable sprocket center drives. Includes standard, and made-to-order conveyor attachments. *Acme Chain Corp., Holyoke, Mass.*

Circle **301** on Reader Service Card

Motor controls

Servospeed motor controls are systems for remotely controlling the speed of motors by rectifying ac power to dc motors. Fifteen page brochure covers subfractional (1/50 to ¼ hp), full wave and integral hp models. Shows dimensions and gives complete data. *Electro-Devices, Inc., Paterson, N. J.*

Circle **302** on Reader Service Card

Reference data for springs

Brochure discusses the features of precision springs in a variety of types from simple compression, extension and torsion springs to Belleville, wave and finger-type washers. Four slide parts (both round and flat wire forms) and non-ferrous specialties are included. Details design formulas and tabulates much reference material. Also gives a photo production facilities survey. *The Timms Spring Co., Elyria, Ohio.*

Circle **303** on Reader Service Card

Cam selection

Catalog No. 903 describes and illustrates the Universal system of cam design theory. Explains principles used to develop any type of cam for index motions, angular oscillating motions, straight line reciprocating, and linear movements. Covers standard, semistandard, and special designs and gives a brief review of production facilities. *Ferguson Machine Co., St. Louis, Mo.*

Circle **304** on Reader Service Card

Torque synchros for servos

Data Sheet CS/TS-4-11-1 is an aid to the rapid selection of size 11 —400 cycle Thru-bore Control and Torque Synchros for servo applications. Charts more than 25 typical characteristics for transmitters, differential transmitters and receiver transmitters. Schematic drawings, with dimensions show body terminal block spline and other data.

BELT DRIVE DATA

PTD's feature editorial report this month starts on page 19. It tells what's been happening to belt drives. Much additional information is available from manufacturers. Here's a check list of available bulletins. Use the Reader Service Card for copies.

340 **AMERICAN PULLEY CO.**—Twenty-six page catalog section tells all about the 3-5-8 Drive, which use the new 3V, 5V and 8V belts. Contents includes drive and hp tables, selection, and a section on designing a 3-5-8 Drive with non-stock sheaves.

341 **BRAMMER CORP.**—Belt catalog features the Vari-Speed Belt, which comes in widths from ⅞ to 4 in. Tabulates prices, explains how to take belt apart and assemble and gives some information on the new Hypowa detachable link V-belting.

342 **ARTHUR S. BROWN MFG. CO.**—Two illustrated belt brochures on the Tilton S5 and the Tilton Super Speed for light power transmission. The S5 can also be used in conveyor systems.

343 **DAYCO CORP.**—Supplement No. 280-B gives all the design data on a neutral axis arch variable speed belt for agricultural machines. The arch cross-section prevents squashing under load.

344 **DODGE MFG. CORP.**—Engineering Bulletin A695A, 40 pages, gives complete selection, dimensional and installation data on the Dyna-V belt drives, from 1-1500 hp.

345 **GATES RUBBER CO.**—Thirty-three page Design Catalog DH-900 reviews the advantages of the Super HC V-belt Drive. A new numbering system for belts and sheaves, based on measurable dimensions, eliminates the intangible pitch dimensions.

346 **MAUREY MFG. CORP.**—Drive catalog introduces Positive Drives and then has 40 pages of engineering and selection tables for the 5 stock pitches available.

347 **RAYBESTOS-MANHATTAN INC.**—Design advantages and special features of all R/M V-belts are described in 8-page Bulletin M-201. Includes the Poly-V Drive which needs only 3 cross-sections to fit all drives from 1/20 to 1700 hp.

348 **BROWNING MFG. CO.**—Catalog MVP-101-A describes and illustrates a multiple groove variable speed sheave with infinitely adjustable pitch diameter between max. and minimum setting.

Continued on page 62

LITERATURE

Gives wiring diagrams and terminal designations. *Vernitron Corp., Carle Place, L. I.*

Circle **305** on Reader Service Card

Drive tensioner catalog

How to make an old drive improve performance at low cost with tensioners is the subject of Catalog TR-1. Full details on 3 types of Hi-Q drive tensioners that adapt to all types of drive. All 3 types take idler pulleys for Positive drives, V-drives, flat belt drives and sprockets for roller chain drives. *Maurey Mfg. Corp., Chicago, Ill.*

Circle **306** on Reader Service Card

Dihedral spindle couplings

Construction, application, capacity and dimensions are covered in 12-page catalog No. 70. Also details Series D-100 and D-1000 dihedral gear type flexible couplings. Illustrates applications on mills, etc. *Ajax Flexible Coupling Co., Inc., Westfield, N. Y.*

Circle **307** on Reader Service Card

Fractional hp motors

Performance characteristics of different types of fractional hp motors are detailed in Vol 41, No. 2 of company news bulletin. *Bodine Electric Co., Chicago, Ill.*

Circle **308** on Reader Service Card

BELT DRIVE DATA

349 **RUSSELL MFG. CO.**—Brochure US 12 59 gives dimensions, hp capacity and prices of a line of high speed endless woven belts. Belts are said to have withstood speeds up to 145000 rpm on pulleys as small as ⅝ in diam.

350 **DURKEE-ATWOOD CO.**—Catalog section details the Positive Drive belt for drives up to 600 hp and speeds from 100 fpm to more than 10,000 fpm.

351 **R & J DICK CO.**—Plastic belting called Dixylon is said to give outstanding transmission performance at very high speeds. It's described in a 12-page catalog.

352 **PORT WORTH STEEL AND MACHINERY CO.**—Catalog Section 50-C lists over 400 stock sheave sizes for A, B, C, and D section V-belts. Specifications of standard, super and steel cable multi-V belts.

353 **GERBING MFG. CORP.**—Variable speed pulleys are subject of 24-page Catalog No. 600. Also has details of companion sheaves and belts.

310 **AMERICAN BILTRITE RUBBER CO., BOSTON WOVEN HOSE DIV.**—V-belt catalog has 64 pages of general information, selection tables, hp rating table and data for matching belts.

311 **LOVEJOY FLEXIBLE COUPLING CO.**—Variable speed pulleys plus related equipment, including compound drives and wide V-belts and sheaves are featured in a 24 page catalog. Has selection data hp ratings and applications.

312 **MANHEIM MFG. & BELTING CO.**—Interchange belt guide lists equivalent dimensions for rubber and wood block belts. Shows how to measure, install and compute prices various types of belt.

313 **J. E. RHOADS & SONS**—Brochure features Texalon nylon and woven textile belt, said to be almost 100% stretch free. Tabulated hp ratings per inch of width, correcting factors, details of installation and make endless equipment.

314 **REPUBLIC RUBBER DIV., LEE RUBBER & TIRE CO.**—Catalog V-594 lists V-belts in multiple and fractional hp sizes.

315 **SPEED SELECTOR INC.**—Variable pitch sheaves for ratios up to 8:1 and capacities from ¼ to 10 hp are featured in Bulletin No. 80.

316 **U. S. RUBBER CO.**—Brochure gives all the details of a line of positive drive, non-slip timing belts. Need no lubrication, said to be compact and safe.

317 **WORTHINGTON CORP.**—Multi-Wedge drives are said to reduce space requirements up to 50% over other forms of drive. Quick detachable sheaves for easy installation. Bulletin gives details.

ASARCON

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Memphis Bearing & Supply Co.
JACKSON 6-7543
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Dixie Bearings, Inc.
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Milwaukee
Badger Bearing Co.
BROADWAY 2-0231
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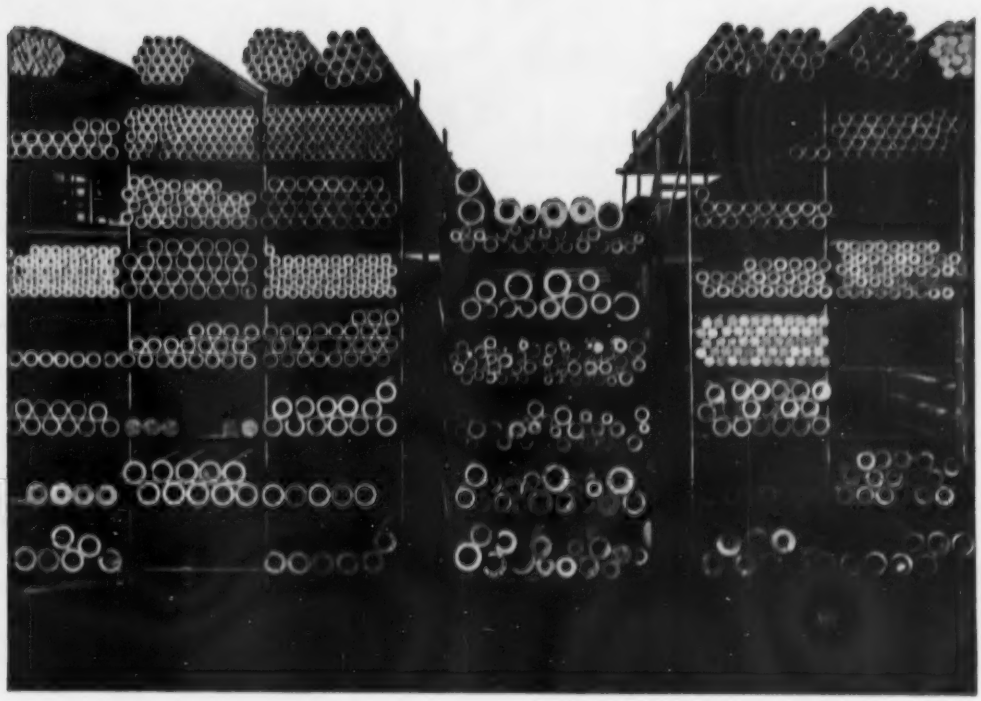

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When you order Asarcon 773 (SAE 660) continuous-cast bearing bronze, you receive the exact length you specify. You choose from more than 260 stock sizes — solids and tubes — and have your order cut in any length you want up to 105″. You never have to include the cost of short end scrap in the price of your finished part, because Asarcon 773 eliminates the remnant problem.

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For further information, call or write your nearby distributor (see listing on opposite page), or write Continuous-Cast Department, American Smelting and Refining Company, Perth Amboy, New Jersey.

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MEN

of the power transmission field

Twin Disc elects DeLong to Board

Roger G. DeLong, vice president-assistant general manager, was elected to the board of directors of the Twin Disc Clutch Co., in an announcement by president John H. Batten.

DeLong joined the company in 1939, serving in a variety of sales and management jobs, including that of vice president of the Hydraulic Division. He was promoted to his present position in 1960.

DeLong

Durgin

Durgin elected new Illinois Gear VP

V. P. Reilly, president of Illinois Gear & Machine Co., recently announced the election of R. L. Durgin as a new vice president.

Durgin joined the company in 1955. He is a graduate of the University of Rochester, and has a background of fifteen years in the gear manufacturing industry. He is affiliated with numerous engineering and technical societies.

Gates adds man for Iowa-Nebraska industry

To provide additional service to Nebraska and Iowa industry, The Gates Rubber Co., appointed Kenneth G. Peterson as district sales coordinator for the Omaha Industrial Sales district.

A graduate of the University of Colorado majoring in physics and mathematics, Peterson has been with the company for 15 years in industrial sales and engineering.

New executive VP for Jeffrey Mfg. Co.

Recently named executive vice-president of The Jeffrey Mfg. Co., was former works manager Frank J. Durzo.

Durzo joined Jeffrey in March 1947 as industrial engineer supervisor, and after a series of promotions, was elected to the board of directors in 1957.

Durzo is replacing C. J. Leifeld who retired in May after a career of 45 years with the company.

Durzo

Woodman

White names Woodman to Houston sales post

George M. Woodman has been appointed to the sales staff of the White Diesel Engine Division of The White Motor Company and has been named as one of the sales representatives in the firm's Houston office.

Woodman will be responsible for the sale of White Superior compressors and gas engine-compressor sets to the petroleum, petrochemical, and industrial markets.

Since his graduation from the University of Texas in 1956 with a degree in mechanical engineering, Woodman has been selling similar equipment in the Gulf Coast area.

He is member of the AIME, ASME, and TSPE engineering societies.

Kevill appointed sales manager for Janette

Kevill

James T. Kevill has been appointed sales manager of the Janette Division of National Pneumatic Co., Inc. of Boston.

An engineering graduate of Technical College, Coatbridge, Scotland, Kevill had been New York District Manager for Janette Electric Mfg. Co., prior to its acquisition by National Pneumatic in the fall of 1960. He is a former President of the New York Chapter of the Power Transmission Council.

New sales order assistant at Formsprag

Appointment of Howard M. Cole as sales order assistant is announced by the Formsprag Company, Warren. He reports to John W. Hamm, sales order manager.

A 1958 graduate of Lawrence Institute of Technology, where he earned a B. S. degree in industrial management, Cole was formerly associated for two and a half years with Chrysler Corporation's missile operation in Van Dyke where he was spare parts equipment analyst.

Tessendorf to manage newly named Worthington Div.

Draper E. Tessendorf is the new general manager of the Worthington Corp's renamed Mechanical Power Transmission Div., located at Oil City, Pa.

Manufacturing activities at this Worthington location have been concentrated on mechanical power transmission equipment, following the transfer of power pump production to the Harrison Div.

Tessendorf joined Worthington in 1933 as a sales specialist, after six years with Allis Chalmers. Since then he has served in numerous posts, the most recent being product manager, mechanical power transmission products.

Endevco Corp. appoints field engineer

Endevco Corporation, Pasadena, California, electronic instrumentation firm, announces the appointment of H. N. "Hal" Gilmore as field engineer to work out of the Gates Mills (Cleveland), Ohio office.

Gilmore has a diversified technical background having worked as sales engineer for Powers Regulator Co., Cleveland; district sales manager for the Midwest with Aeronautical Division of Robertshaw-Fulton of Anaheim; and was with the environment lab of Goodyear Aircraft in Akron, Ohio.
Gilmore attended the University of Washington in Seattle and Akron University;

Gilmore

Murphy

American Sealants names Chicago sales manager

Daniel T. Murphy will handle sales for the American Sealants Co., in their Chicago district. He will coordinate Loctite Sealant sales throughout the entire midwest area.

Prior to joining American Sealants, Murphy was with Hewitt-Robins and American Pulley. A graduate in mechanical engineering of Rensselaer Polytechnic Institute, he has also done graduate study in business administration at New York University.

Loctite is used to prevent assembled parts from being loosened by vibration. The new district sales manager represents a major expansion into an important industrial area.

Brammer appoints new mid-west manager

The Brammer Corporation, New York, appointed Christian F. Johnson as mid-west district manager-operating out of the Chicago area. Johnson knows the V-Link Belt field in all its phases. He formerly served in a similar capacity for the Manheim Manufacturing Company.

Acme Double Pitch Chains were developed for industries requiring the use of high grade precision chains at a lower cost than the standard series. Acme has developed these chains that are highly adaptable to slower speed power transmission drives. These are widely used in materials handling conveyor systems, by using round parts of the standard chain series and doubling the chain pitch. Acme Double Pitch Precision Chain is available in standard steel and in stainless steel up to 4" pitch for all conveyor systems.

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Double tooth cutting actually doubles the life expectancy of the sprocket.

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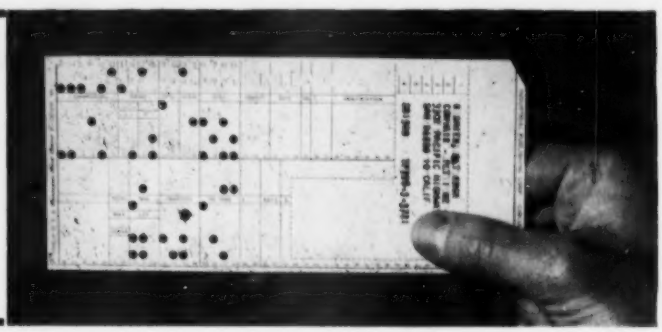

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